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HEWITT (E. J.) & JONES (E. W.). **The production of molybdenum deficiency in plants in sand culture with special reference to Tomato and Brassica crops.**—*J. Pomol.*, xxiii, 3–4, pp. 254–262, 12 pl., 1947.

At Long Ashton Research Station seedlings of Savoy cabbage, Majestic cauliflower, and Market King tomato after germination on glass wool with purified nutrient solution, were transferred on 27th June, 1947, when the first true leaves were beginning to expand, in lots of three to pyrex-glass beakers (with a central drainage hole covered with glass-wool and a filter disk) containing purified silica sand. Two weeks later the plants were thinned to one or two. The purification of the basal nutrient reagents followed the procedure of Scott and Mitchell (*J. Soc. chem. Ind., Lond.*, lxii, p. 5, 1943). Boron as boric acid and manganese, copper, and zinc as sulphates were supplied in a micro-nutrient solution and molybdenum as ammonium molybdate in a separate one.

Tomato seedlings in the molybdenum-free solution developed the first symptoms after two to three weeks in the older leaves, which showed interveinal, diffuse, yellow-green mottling and upcurled margins. Necrosis and shrivelling of the leaf tips spread from the end leaflet to all, the old leaves finally becoming pale brown and papery. The petioles pointed downwards. The cotyledons remained bluish-green for several weeks, while the pale yellow-green upper leaves were mottled and scorched.

Savoy cabbage and cauliflower after three weeks developed pale yellow-green marginal and interveinal mottling of the older leaves, and the foliage had a water-soaked appearance. Rapid incurling and withering of the margins and tips of the leaves followed and the old leaves ultimately shrivelled and dropped off. A gradual recovery, however, was observed after six weeks. At a later stage the middle leaves of some cauliflower plants became brown and withered at the tips; the stunted petioles continued to elongate, however. They were almost devoid of lamina except for the stipule-like portions around the leaf base. This condition appears to be identical with that known as 'whiptail' [*R.A.M.*, xxvii, p. 400]. In spite of the death of the growing point in several plants the pale green and diffusely mottled older leaves with uncurled tips remained turgid. The symptoms in Savoy cabbage were less spectacular in the later stages. The early mottling persisted and the plants failed to 'heart'. The downward-pointing petioles remained 'open' and the middle leaves showed an irregularly outlined, brown marginal necrosis.

White mustard seeds were sown on 12th September, 1947, directly in sand following oat plants, which had failed to exhibit the characteristic deficiency symptoms [ibid., xix, p. 727]. The mustard seedlings, however, developed symptoms similar to the early symptoms of the tomatoes and the brassicas.

Leaf tests indicated that most of the plants starved of molybdenum accumulate nitrate in their leaf (petiole) tissues, with the exception of Savoy cabbage, for which no explanation can be given.

All symptoms due to molybdenum deficiency disappeared in 48 hours when a tomato seedling was injected with a solution of 10 p.p.m. molybdenum (A.R grade ammonium molybdate), and did not reappear. Similar rapid recoveries occurred in tomatoes and Savoy cabbage, the leaf surfaces of which were painted with a 100 p.p.m. molybdenum solution, and in cauliflower plants, by placing a drop of the solution on an incision made in a leaf vein. In the brassicas, however, the symptoms recurred after four to five weeks.

CHUPP (C.). **Control of black rot of Cabbage in New York.**—*Plant Dis. Reptr*, xxxi, 12, p. 479, 1947. [Mimeographed.]

An interesting possibility in the control of black rot of cabbage (*Xanthomonas campestris*) [*R.A.M.*, xxiv, p. 349] is opened up by the report of a grower in Cayuga county, New York, that hardly any infection developed in four rows of cabbage which had been sprayed six times with Bordeaux 10–5–100 plus 2 lb. DDT at 100 gals. per acre, while the unsprayed rows were severely attacked.

COCHRANE (V. W.). **The role of plant residues in the etiology of root rot.**—*Phytopathology*, xxxviii, 3, pp. 185–196, 2 graphs, 1948.

The author's investigation, carried out at the Connecticut Agricultural Experiment Station, is based on the assumption that certain root rots are initiated by the toxic action of plant residues, the etiological function of soil organisms in such cases being of secondary importance [cf. *R.A.M.*, xvi, p. 67; xx, p. 541; xxi, p. 448].

Direct injury to root tissue by plant extracts can be essayed by exposure of the radicles of 72-hour-old radish seedlings to the action of cold-water extracts of the ground plant tissue. Extracts from undecomposed Ladino clover and from perennial rye grass [*Lolium perenne*] induced browning of radish roots in eight hours. The residues were allowed to decompose at two moisture levels, namely, a 'dry' series equivalent to 50 per cent. of saturation, incubation being effected in crocks with loose covers, and a 'wet' series in which dry plant material and tap water were added to Mason jars in a ratio of 1:20. This process resulted in a progressive disappearance of the factor causing injury, although microbial action caused temporary increases in toxicity. The destruction of the injurious principle in clover tissue was accelerated at 56° C., presumably in consequence of the activities of thermophilic bacteria. With this exception, studies of microbial populations in the decomposing residues failed to establish any significant connexion of particular groups of micro-organisms with the appearance or disappearance of damage to the roots.

Extracts from undecomposed maize stover did not induce radish root browning, but extracts from the same material decomposed under water caused the development of noticeable injury, attributed to microbial action, for periods ranging from 28 to 42 days. Soy-bean tissue extracts were innocuous to radish roots before, during, and after decomposition.

AFANASIEV (M. M.). **The relation of six groups of fungi to seedling diseases of Sugar Beets in Montana.**—*Phytopathology*, xxxviii, 3, pp. 205–212, 1948.

The pathogenicity of 13 isolates of *Phoma*, 10 of *Macrosporium*, 47 of *Fusarium*, five of *Rhizoctonia*, eight of *Aphanomyces cochlioides*, and two of *Pythium* isolated from sugar-beet seedlings in Montana [*R.A.M.*, xxv, p. 148] was tested on the same host. *A. cochlioides* [ibid., xxv, p. 4] proved to be the most pathogenic, the eight original isolates causing an average of 99·4 per cent. infection and the same number of reisolates 98·6. This was the only one of the fungi to be assigned the pathogenicity rating of 'severe'. The original isolates of *Phoma* and *Pythium* induced averages of 89·1 and 84·8 per cent. infection, respectively, while the reisolates (four of the former and two of the latter) were rated as 'variable (2·2 to 71·3 per

cent., average 25·3)' and 'slight' (average 8·8 per cent.), respectively. The pathogenicity of *Fusarium*, *Macrosporium*, and *Rhizoctonia* was slight, as also was that of a culture of *Phoma betae* from the American Type Culture Collection in comparison with the Montana isolates of *Phoma*. The symptoms induced in beets by inoculation with *A. cochlioides* corresponded most closely to those of black root on seedlings in the field, and this fungus is believed to be responsible for most of the disease in the State. Some of the other organisms are only weak parasites, possibly acting as secondary invaders.

Toh (J. S.) & Chen (S. L.). **The effect of seed disinfection on the germination and growth of Peas (Pisum sativum L.).**—*Fukien agric. J.*, ix, 1–2, pp. 44–51, 1947. [Chinese, with English summary.]

In an experiment carried out at the Fukien Christian University in the autumn and winter of 1946, treatment of pea seed, each lot containing 960 seeds, before sowing, with 2 gm. spergon, gave the best germination, while the results with 3 gm. black copper oxide were promising. An untreated lot served as control and the results were statistically analysed.

Price (W. C.) & Holt (Betty R.). **Kentucky Wonder Bean plants as hosts for measuring Bean mosaic virus activity.**—*Phytopathology*, xxxviii, 3, pp. 213–217, 1 graph, 1948.

The numbers of necrotic lesions produced on both Kentucky Wonder Wax and Kentucky Wonder Green Pod bean (*Phaseolus vulgaris*) plants, inoculated with a series of six dilutions of southern bean mosaic virus [*R.A.M.*, xxvii, p. 107], were found to follow an equation derived on the assumption that the virus particles are aggregated and that the likelihood of obtaining infection is related to that of finding a single infectious aggregate, or particle, in a unit volume of inoculum [ibid., xxv, p. 202]. It is characteristic of this equation that over a certain range the log of the number of lesions is very nearly a linear function of the log of the virus concentration. It follows, therefore, that the Kentucky Wonder varieties are equally suitable test plants with Early Golden Cluster, at the moment unobtainable, for the method of measuring southern bean mosaic virus activity involving comparison of two dilutions of the unknown virus preparation with two of a standard. Data bearing out this conclusion are presented of an experiment designed to measure the activity of a virus sample expected to be slightly less than that of the standard against which it was tested.

Sherwin (Helen S.), Lefebvre (C. L.), & Leukel (R. W.). **Effect of seed treatment on the germination of Soybeans.**—*Phytopathology*, xxxviii, 3, pp. 197–204, 1 fig., 1948.

At the Plant Industry Station, Beltsville, Maryland, temperature exerted a marked effect on the response of several lots of soy-beans to seed treatment [cf. *R.A.M.*, xxvi, p. 280]. Increases in germination resulted from this practice more often at 25° C. than at any other temperature. Of the three fungicides used, arasan (2 oz. per bush.) was more consistently beneficial in its action on the seed than spergon (2 oz.) or new improved ceresan (½ oz.). Seed originating in Georgia, Mississippi, North Carolina, Maryland, and Virginia appeared to react more favourably to treatment than did Illinois-grown material. Soy-bean seed treated and then stored for a year gave a relatively larger increase over the check than did that planted shortly after disinfection, but total emergence was less in the former case.

A lot of Wood's Extra Early Yellow seed from Virginia was divided into three classes according to the extent of discoloration, viz., (1) beans with at least half the area of the seed coat of each discoloured; (2) less than half the seed coat affected;

and (3) no discoloration. In classes (1) and (2) *Cercosporina kikuchii* [loc. cit.] was readily isolated from purple blotches on the beans, and *Peronospora manshurica* [ibid., xxvi, p. 156] formed conspicuous, whitish crusts of oospores on many others. In constant-temperature rooms the moderately discoloured and clean seed was more improved by treatment than the badly affected, but under field conditions the effects on the three classes did not differ significantly.

MUNTAÑOLA (MARIA). **Bacteriosis de las hojas de Lechuga (Pseudomonas marginalis (Brown) Stapp).** [Lettuce leaf bacteriosis (*Pseudomonas marginalis* (Brown) Stapp).]—*Publ. misc. Minist. Agric. B. Aires*, Ser. A, iv, 40, 11 pp., 3 figs., 1948.

Foliar bacteriosis of lettuce, endive, and chicory (*Pseudomonas marginalis*) [*R.A.M.*, xx, p. 451] is reported for the first time from Argentina, where it is widely distributed in the province of Buenos Aires, causing losses of 60 per cent. and upwards where cultural precautions are neglected. Uniformly positive results were given by inoculation experiments on wounded and intact leaves of greenhouse and field plants, the incubation period ranging from two to five days. The development of infection is promoted by dampness and heaviness of the soil and by high atmospheric humidity. Where wide spacing, sparing use of water, and annual crop rotation are practised the damage from leaf bacteriosis rarely exceeds 10 per cent.

LINN (M. B.) & NEWHALL (A. G.). **Comparison of two methods of pelleting Onion seed in the control of smut.**—*Phytopathology*, xxxviii, 3, pp. 218–221, 1 fig., 1948.

The primary objects of a method for pelleting vegetable and other kinds of seed developed by the Michigan Farmers and Manufacturers Beet Sugar Association, in co-operation with the Dow Chemical Company, are to add bulk to light seed and secure uniformity in the size of individual seeds in order to facilitate precision sowing with mechanical equipment. Briefly, the process involves placing the seed in a revolving spherical pan, then alternately wetting with a binder (methyl cellulose solution) and dusting with feldspar and other materials until round pellets of the required dimensions have been formed. In this way plant-protectives and the like can be built into the 'pill' and planted with the seed.

Another procedure was devised by the junior author in 1944 in New York as a substitute for the cumbersome formaldehyde drip method of combating onion smut [*Urocystis cepulae*: *R.A.M.*, xxv, p. 590]. It involves moistening the seed in a 5 per cent. solution of methyl cellulose and then coating with an equal weight of an organic sulphur fungicide, the feldspar excipient not being used. In one field and two greenhouse tests in New York and one field trial in Illinois, using arasan and tersan at the rate of 1 lb. per lb. seed of the Early Yellow Globe variety, the New York method proved at least equally effective with the more expensive Michigan process or even slightly more so. An attempt was made to reduce the cracking of the Michigan feldspar pellets arising from the use of seeders with metal- or wooden-based agitators by the admixture of graphite at the rate of 1½ lb. per 60 lb. pellets, but the resultant benefit was slight.

It is concluded that when seed drills are available which can handle without injury the tough, hard pellets turned out by the Michigan method, then the advantages of more even spacing of seeds in the ground may help to offset the added expense of this treatment. Until then, however, the New York method is somewhat more advantageous from the standpoint of smut control, economy, and uniform stands. In both procedures the occurrence of two or even three seeds in one pellet may affect yield records. In these experiments a larger number of doubles were counted in the Michigan than in the New York samples of pelleted seed (11 as against 2 per cent.).

CHUPP (C.). **Stemphylium cucurbitacearum on Cucumber.**—*Plant Dis. Reptr*, xxxi, 12, pp. 479–480, 1947. [Mimeographed.]

A re-examination of some co-type material of G. A. Osner's *Stemphylium cucurbitacearum* on cucumber leaves [*J. agric. Res.*, xiii, 5, p. 295, 1918] deposited at the Cornell Herbarium, New York, in 1915 revealed no true pathogen which could have caused the numerous leaf spots, and only a trace of *S. botryosum* [*Pleospora herbarum*], probably only weakly pathogenic. None of the specimens in the herbarium at Purdue University, including some of the co-type material, bore any fungus pathogen, and as the tissues of three specimens (including one of the co-types) yielded numerous bacteria and the lesions and spots on the material closely resembled bacterial angular leaf spot, it is concluded that the pathogen was *Pseudomonas lacrymans* [*R.A.M.*, xxvi, p. 279].

WALKER (M. N.). **The Blacklee Watermelon. A new Fusarium wilt-resistant variety for Florida.**—*Pr. Bull. Fla agric. Exp. Sta.* 605, 4 pp., 1 fig., 1944. [Received June, 1948.]

A description is given of a new watermelon variety, Blacklee, which has been developed in Florida and shows resistance to wilt (*Fusarium bulbigenum* var. *niveum*: *R.A.M.*, xxvi, p. 379; xxvii, p. 8], while at the same time possessing other desirable qualities. It results from a cross made between Hawkesbury and Leesburg in which the former was the male parent. In a test in 1944 on infested soil, 90 per cent. of the Blacklee plants were free from wilt at harvest time, as against 14 per cent. survival of Stone Mountain.

ATKINS (F. C.) & LA TOUCHE (C. J.). **Disease caused by Mycogone perniciosa Magnus (Bubble).**—*Mushroom Dis. Leafl.* 3, 3 pp., 5 figs., 1948.

This description of the bubble disease of mushrooms comprises a summary of its characteristic features, the source of infection, methods of prevention and control, and a description of the causal organism, *Mycogone perniciosa* [*R.A.M.*, xxv, pp. 58, 94].

HEIM (R.). **Volvaria esculenta Massee.**—*Bull. Soc. mycol. Fr.*, lxiii, 3–4, pp. 121–126, 2 pl. (1 col), 3 figs., 1947.

In this paper are presented the synonyms and the macroscopic and microscopic characteristics of *Volvaria esculenta* [*R.A.M.*, xvii, pp. 158, 649], together with its habitat, distribution, and distinguishing features.

BARNETT (H. L.) & LILLY (V. G.). **The relation of thiamin to the production of perithecia by Ceratostomella fimbriata.**—*Mycologia*, xxxix, 6, pp. 699–708, 1947.

An isolation of *Ceratostomella fimbriata* [*R.A.M.*, xxvi, p. 528] from a diseased sweet potato when grown in a liquid or agarized basal medium containing 25 to 100 μgm. of thiamin per l. produced numerous to abundant perithecia after six days, while those with less than 3·12 μgm. thiamin produced none, and cultures without the vitamin made only a trace of growth. The abundance of conidia was apparently not influenced by the amount of thiamin in the medium, except in so far as it affected the amount of mycelium produced. Thiamin-starved mycelium produced perithecia only when transferred to media high in thiamin.

It is concluded that under the same conditions the formation of perithecia requires more thiamin than that of mycelia; the presence or absence of perithecia is determined by the amount of thiamin in relation to the amount of nutrients in the medium; and that the abundance of perithecia is influenced by the amounts of both nutrients and thiamin. [This work is published as Scientific Paper No. 374 of the West Virginia Agricultural Experiment Station.]

Castellani (E.). **Osservazioni fitopatologiche sul 'Berbere'. I. Cercosporiosi.** [Phytopathological observations on Chilli. 1. Cercosporiosis.]—*Riv. Agric. subtrop. trop.*, xlii, 1–3, pp. 20–29, 1948. [English summary.]

The only noteworthy diseases of chilli (known locally as 'berberè') found by the author in Abyssinia are those caused by a *Cercospora* and by *Oidiopsis sicula* [*Leveillula taurica*], the latter fungus being frequently associated with the former on the same parts of the plant.

The disease due to the *Cercospora* was frequently noted in different parts of Eritrea, Scion, Galla, and Sidama, causing serious infection of both *Capsicum annum* and *C. frutescens*. It became particularly evident with the cessation of the rains when the adult plants were in full fruition. The fungus produced a very pale, later olivaceous-grey, subcircular efflorescence on the most developed leaves, forming sub-circular lesions on the under surface. Later all the leaves became affected, curled up, and fell off in large numbers. Infection appeared to be confined to the leaf blade. The maturation of the fruits was arrested and they frequently developed sun scorch.

Affected material bore deep brown, generally lenticular or subspherical stromata, measuring 27·5 by 22 μ to 60 to 70 by 35 to 38 μ. The conidiophores regularly showed one or more septa at the base, where they were the same colour as the stroma, while at the apex they were smoky-grey and usually non-septate. They were simple or sparsely branched at the base, irregularly cylindrical, tapered towards the apex, were straight or more often slightly incurved, and measured 22 to 36 (mostly 28 to 32) by 4 to 5 μ. The conidia, often closely catenulate but readily separable, were ellipsoidal or subclavate to cylindroid, with a tapering truncated apex. At maturity the wall was thin and smoky-grey. They were continuous or uniseptate, exceptionally bi- to tri-septate, 14 to 40 μ long, occasionally more, and 3 to 4·5 μ at the widest diameter, exceptionally more (in one instance 6 μ). In view of these characteristics, the fungus is considered to be a *Cercospora* of the *Raghnildiana* group [*R.A.M.*, xi, p. 129].

A comparison with original material showed that the author's fungus closely resembled *C. capsici* Unamuno [ibid., xi, p. 605] and appeared to be identical with the organism originally studied by Marchal & Steyaert and renamed *Cladosporium capsici* (March. & Stey.) Kovac. by Kovačevski [ibid., xvii, p. 791]. The author, however, does not accept Kovačevski's identification of *Cercospora capsici* March. & Stey. [loc. cit.] with Unamuno's fungus because in the former the stromata are lacking or only very sparsely present. *C. capsici* March. & Stey. would appear (from the diagnosis) to be near *C. diffusa*, which differs from the author's fungus in its much longer conidia, sparse superficial mycelium, and small stromatic masses, generally less than 20 μ in diameter, looser and less deeply immersed in the host tissues.

The author's fungus, widely prevalent in Europe and Africa, is retained in *Cercospora*. As *C. capsici* Heald & Wolf, which is quite different, has priority, a new name becomes necessary and the author proposes *C. unamunoi* nov. comb. (syn. *C. capsici* Unam., nec Heald & Wolf 1911, nec Marchal & Steyaert 1929, *Cladosporium* sp. Bensaude 1926 [ibid., vi, p. 81], and *C. capsici* (March. et Stey.) Kovac.). Unamuno's diagnosis fits it well, but the words *saepe breve catenulatis* should be added to the description of the conidia.

De Preter (E.). **Note sur la sélection de l'Arachide et les résultats pratiques obtenus à ce jour à la Station de Gandajika.** [A note on Groundnut selections and the practical results so far obtained at Gandajika Station.]—*Publ. Inst. nat. Étude agron. Congo belge, 1947* (hors sér.), pp. 403–408, 1947.

Groundnut losses from rosette disease [*R.A.M.*, xxvi, 236, 282] in the Belgian Congo may be as high as 80 to 90 per cent. of the crop. Very good results followed

close planting, late weeding, avoiding the planting of groundnuts two years running in the same soil, and destroying self-sown plants. So far, no variety has been found resistant, but the creeping varieties are more susceptible than the erect ones [cf. ibid., xxiii, p. 432].

PARHAM (B. E. V.). **Economic botany notes. 3. Disease of Taro.**—*Agric. J. Fiji*, xviii, 3, p. 80, 1947.

In July, 1946, the Senior Agricultural Officer, B[ritish] S[olomon] I[slands] P[rotectorate] recorded the occurrence of a disease, suspected to be of virus origin, which had destroyed the entire taro [*Colocasia antiquorum*] crop on the Shortlands and was also thought to be present on Choiseul. He considered that the condition had spread from Bougainville and represented a very serious threat to the taro crop in the Protectorate. The affected plants suddenly wilted and rotted away. It was at once recommended that the export of all roots, soil, and planting material from the Shortlands should be prohibited, in order to prevent spread farther east. The disease has since been determined as due to *Phytophthora colocasiae* [*R.A.M.*, xx, p. 514].

GAVAUDAN (P.) & DEBRAUX (GERMAINE). **Valeurs comparées du sel d'ammonium de l'hexanitrodiphénylamine et du sulfate de cuivre dans la prophylaxie du mildiou de la Vigne.** [Comparative values of the ammonium salt of hexanitrodiphenylamine and copper sulphate in the prophylaxis of Vine mildew.]—*C.R. Acad. Sci., Paris*, ccxxvi, 16, pp. 1304–1305, 1948.

At a concentration of 0·011 gm. per l., ammonium hexanitrodiphenylamine (also known as 'aurantia') completely inhibited the development of *Plasmopara viticola* on detached vine leaves in the laboratory. The dye, which is easily prepared, inexpensive, and stable to air and light, offers a wide margin of safety, being innocuous to the foliage until the strength indicated above is exceeded by upwards of 20 times. In the field a solution of 'aurantia' (0·12 gm. per l.), incorporated in a mixture of calcium caseinate and aluminium sulphate, gave very encouraging results, resisting the action of rain or dew for a sufficiently lengthy period and equalling 2 per cent. Bordeaux mixture in prophylactic efficiency.

MOREL (G.). **Méthode d'essai en serre des produits de lutte contre le mildiou de la Vigne.** [A method of testing in the greenhouse materials for the control of Vine mildew.]—*Ann. Épiphyt.*, N.S., xiii, pp. 57–66, 6 figs., 1947.

The author describes a rapid and convenient method for testing large numbers of fungicides against vine downy mildew (*Plasmopara viticola*) in the greenhouse. Tissue cultures of vine inoculated with the fungus are maintained [*R.A.M.*, xxvi, p. 6] to supply inoculum, and for the inoculations one-year-old vine plants grown in pots and a suspension in distilled water, with approximately 50,000 sporangia per c.c., are used. This is sprayed with a hand-atomizer working at a constant pressure of 0·2 kg. per sq. cm. on to the lower surface of the leaves of a plant 50 to 75 cm. high, preferably with only one stem. During the operation the plant is rotated at the rate of 20 revolutions per minute. The plant is then removed to an infection chamber in the greenhouse at 18° to 20° C. and having a saturated atmosphere, and kept there for 24 hours, the leaves remaining wet the whole time. After six days the plants are put back in the chamber for a further period of 24 hours, to induce conidial development.

The fungicidal treatment is as follows. Five gm. of the product finely ground are mixed with 1·5 gm. bentonite, and slowly diluted with 1 l. water. The addition of 'novemol' renders the product more adhesive. Insoluble liquids are emulsified with ammonium oleate. Four plants are sprayed equally with 100 c.c. of the

prepared fungicide with a paint spray working at a pressure of 2 kg. per sq. cm., the plants again being placed on a rotating table. The fluid is allowed to dry for 24 hours, after which the four treated plants and an unsprayed control are inoculated with the conidial suspension of *P. viticola*. They are then placed in the damp chamber for 24 hours, and six days later examination of the leaves is made. In no instance has any infection been observed after treatment with 0·5 per cent. Bordeaux mixture, so that any treatment not giving equally good control can be discarded at once.

This method, using only one infection chamber of the size employed in the author's experiments, allows four products to be tested every two days, the results becoming apparent 10 days after spraying. The work can be carried out at all seasons. During the past few years a large number of organic compounds have been tested by this technique and the few that gave good results are now being tested in the field [see next abstract].

Kovache (A.), Ficheroulle (H.), Raucourt (M.), & Morel (G.). **Recherches sur les propriétés fongicides de certains composés organiques.** [Researches on the fungicidal properties of certain organic compounds.]—*Ann. Épiphyt.*, N.S., xiii, pp. 67–81, 1947.

Using Morel's method [see preceding abstract], tests against vine downy mildew (*Plasmopara viticola*) with 38 synthetic organic compounds showed that the following completely inhibited all development of the fungus on vine foliage without having any phytocidal effect: zinc dimethyldithiocarbamate, copper phenyldithiocarbamate, zinc xylyldithiocarbamate, cadmium ethylenediaminodithiocarbamate, iron ethylenediaminodithiocarbamate, lead ethylenediaminodithiocarbamate, and 2, 6- dinitro-1-thiocyano-4-chlorobenzene [cf. ibid., xxvii, p. 287].

Materials which were also effective but caused slight burning were copper methyldithiocarbamate, zinc phenyldithiocarbamate, and copper sulphanilate.

It was confirmed that the dimethyl derivatives of the dithiocarbamates are more fungicidal than their higher homologues. The dimethyl-, phenyl-, and ethylenediamino- derivatives of dithiocarbamic acid appeared to give a particularly high proportion of fungicidal salts; the monomethyl series and derivatives of sulphanilic acid deserve further study. The thiuramsulphides were not as effective as some workers have claimed. Thiocyanodinitrochlorobenzene was not inferior to thiocyanodinitrobenzene. The fungicidal activity of the metallic salts of organic acids is not related to that of the metal when their molecular weight is sufficiently high.

While further verification is called for, the following gave some evidence of marked phytocidal effect: the salts of trithioallophenic acid; the cadmium salts of the methyl, dimethyl-, phenyl-, and xylyl-dithiocarbamic acids; and aluminium ethylene- diaminodithiocarbamate.

[A brief review of this work by M. Raucourt was published in *Rev. Hort., Paris*, N.S. xxxi, 4, pp. 105–106, 1948.]

Michel (A.). **Sur un nouvel aspect du problème du court-noué de la Vigne.** [On a new aspect of the problem of Vine court-noué.]—*C.R. Acad. Agric. Fr.*, xxxiv, 3, pp. 179–181, 1948.

The author puts forward the view that vine court-noué [*R.A.M.*, xxvii, p. 348] may perhaps be due to the large quantities of copper accumulating in the soil as a result of the spraying of vines in the last 40 years.

In areas where there were groups of affected vines surrounded by healthy ones it was found that in every plot examined the appearance of court-noué and the development of the symptoms were closely related to the rate of disappearance of copper from the top layer of the soil and to the amount of copper present in that

part of the soil in which the roots were growing. Copper was found to pass into the subsoil in an insoluble form, favoured by the porousness of the soil.

The author considers that the copper may cause coagulation of the protoplasmic proteins of the vine and so induce death of the affected cells. This may be what happens to the absorbing hairs, the loss of which prevents exchange of materials between plant and soil and so leads to wilting and death. Further work is in progress.

MICHEL (A.). **Étude préliminaire sur un nouvel aspect du problème du court-noué de la Vigne.** [A preliminary study on a new aspect of the problem of Vine court-noué.]—*Ann. agron., Paris*, N.S., xviii, 2, pp. 179–193, 1948.

This is an expanded account of work already noticed from another source [see preceding abstract].

DESFLASSIEUX (A.). **Quarante années d'expérience sur les Raisins de table.** [Forty years' experience with dessert Grapes].—*Rev. hort., Paris*, N.S., xxxi, 4, pp. 99–104, 2 figs., 1948.

Of the best varieties selected from a cross made over 20 years ago by Piravano, a leading Italian grape-breeder, between the two leading dessert varieties Muscat de Hambourg and Bicane (Chasselas de Napoléon) and which have become adapted to conditions at Colombier and Monestrol, Perlona has retained the resistance of the former parent to *Oidium* [*Uncinula necator*: *R.A.M.*, xxvi, pp. 283, 285], especially during the years 1942 to 1944, when the lack of sulphur resulted in great damage among varieties susceptible to the disease. It is considered that crosses involving Sabalkanskoi, Alphonse Lavallée, and Valensi Royal as parents would produce good hybrid vat grapes inheriting the disease resistance of their parents.

LUTTRELL (E. S.). **Botryosphaeria ribis, perfect stage of the Macrophoma causing ripe rot of Muscadine Grapes.**—*Phytopathology*, xxxviii, 3, pp. 261–263, 1 fig., 1948.

Further observations in Georgia on the ripe rot of muscadine grapes attributed to *Macrophoma* sp. [*R.A.M.*, xx, p. 623] have resulted in the discovery of the perfect state of the fungus, herein tentatively referred to *Botryosphaeria ribis*. The genus *Botryosphaeria*, however, is in urgent need of study and revision, the determination of specific limits within it being at present impracticable.

The first symptoms of ripe rot, the incidence of which increases as the already full-sized berries mature, are circular, flat, or slightly depressed, 'bird's eye' spots, 1 to 4 mm. in diameter, dark brown, with small, tan or buff-coloured centres harbouring a few *Macrophoma* pycnidia. This is usually the most severe manifestation of the disease, but on a highly susceptible variety, such as Thomas, a brown, soft rot may spread from the lesions over the berries, which drop from the vines and are ultimately reduced to dry, hollow shells covered with pycnidia. In the later phase of the rot *Melanconium fuligineum* often enters the berries and may be partially responsible for the damage.

Ripe rot does not at present appear to be of much importance or to call for control measures. The Lucida, Howard, and Dulcet varieties are susceptible, though less so than Thomas, but Hunt, the chief commercial variety in the State, is resistant, as also are Greek, Scuppernong, Irene, and Yuga. In 1946, for instance, counts of the berries dropped from two vines each of Hunt and Thomas revealed the presence of ripe rot on only 0·39 per cent. of the former, with an estimated responsibility for 0·06 per cent. of the shedding, the corresponding figures for the latter being 25·45 and 11·31, respectively. However, only 12·38 per cent. of the total crop fell from these two varieties, and even on Thomas the proportion

of the loss attributable to *B. ribis* did not exceed 1·4 per cent. Blighted peduncles of flower and berry clusters also yielded *B. ribis*, *M. fuligineum*, and species of *Alternaria*, *Glomerella*, *Diaporthe*, and *Pestalotia*.

The *Macrophoma* pycnidia collected on diseased grapes were spherical, 153 to 197 μ in diameter, and contained hyaline, unicellular, narrowly elliptical to ovoid pycnidiospores, 14 to 25·2 by 5·6 to 8·4 (average of 25, 19·6 by 6·6) μ. They were found on berries fallen from the vines during the preceding season, so that the fungus is evidently capable of surviving the winter in the pycnidial stage. Pycnidiospores from an overwintered berry measured 16·8 to 24·6 by 5·6 to 7·8 (20·9 by 6·4) μ. Isolates from overwintered berries rarely fruited on agar media, but could mostly be induced to do so on sterile grape stems semi-immersed in water in culture. Pycnidiospores formed under these conditions were elliptical to fusiform, the average dimensions of four isolates being 19 by 5·8, 22·1 by 5·5, 22·8 by 4·9, and 23 by 7 μ.

The perfect state was obtained by the inoculation of sterile grape stems in culture tubes with isolates of the pathogen and overwintering the material out-of-doors. During the late autumn and winter pycnidia, spermogonia, and ascocarp initials were produced in botryose stromata on the stem, a character that would place them in *Dothiorella*. The mature ascocarps developing in the stromata the following spring were spherical and measured 172 to 315 μ in diameter. The locule was filled with paraphyses and cylindrical asci with a two-layered wall, 102·4 to 156·8 by 17·6 to 24 μ, containing eight hyaline, unicellular ovoid to elliptical ascospores, 19·6 to 30·8 by 8·4 to 11·2 (24·9 by 10·3) μ. Isolates derived from ascospores were identical with those emanating from decayed berries bearing the *Macrophoma* pycnidia.

The relationship of the *Botryosphaeria* perfect state on overwintered stems with the *Macrophoma* imperfect state associated with berry rot is based on the morphological connexion of the pycnidia and ascocarps on grape stems and on the cultural similarities of the isolates from both sources. The results of inoculation tests have been inconclusive owing to natural infection of berries in the field with both *B. ribis* and *Melanconium fuligineum*.

Plantesygdomme i Danmark 1945. Aarsoversigt samlet ved Statens plantepatologiske Forsøg. [Plant diseases in Denmark in 1945. Annual survey of data collected by the State Phytopathological Experiment Station.]—*Tidsskr. Planteavl*, li, 3, pp. 373–437, 2 graphs, 1946. [English summary. Received May, 1948.]

The sections contributed to this report [cf. *R.A.M.*, xxv, p. 202] by H. R. Hansen and Anna Weber contain the following among many other items of interest. Phosphorus deficiency was widespread and sometimes severe; its symptoms, especially in the case of barley, closely resemble those of soil acidity [magnesium deficiency: ibid., xvii, p. 385]. Rye sustained heavy damage from manganese deficiency in a number of localities, and the same trouble was reported to be serious among spring cereals, fodder beets, and potatoes. Barley loose smut (*Ustilago nuda*) was exceptionally prevalent throughout the country, its incidence, however, generally not exceeding 1 per cent.

Violet root rot (*Helicobasidium purpureum*), which is of very rare occurence on legumes in Denmark, was observed on sweet clover (*Melilotus*) in one place and on red clover in another. Destructive attacks of lucerne wilt (*Verticillium albo-atrum*) were reported from several localities.

The beet mosaic and beet yellows viruses were prevalent, the former causing appreciable damage in fodder crops grown for seed in various districts. Downy mildew (*Peronospora schachtii*) caused 10 to 20 per cent. infection in a number of places.

The potato late blight (*Phytophthora infestans*) epidemic of 1945 was the worst for several years, the first outbreaks in east Jutland developing at the end of June. By the end of July the first and second early and early maincrop stands were decimated, while during August even such late varieties as Gustav Adolf and Robusta were extensively infected. The tubers, notably of early and second-early varieties, suffered heavy damage (up to 70 per cent.) from the dry rot phase of the same pathogen. Powdery scab (*Spongospora subterranea*), uncommon in Denmark, occurred in three districts, in one of which a three-acre field of Deodara was severely infected.

Substantial losses among stored apples, especially of the Graasten variety, were caused by pink mould (*Trichothecium roseum*) [ibid., xviii, p. 119].

New records include a virus disease of the mosaic type affecting purple, violet-striped, and white crocuses [cf. ibid., xi, p. 591] in a Lyngby garden, the yellow being normal; *Ramularia vallisumbrosae* on *Narcissus poeticus* [ibid., xx, p. 206]; *Clasterosporium carpophilum* on Morello cherry fruits; and *Alternaria anagallidis* var. *linariae* [ibid., xxv, p. 582] on *Chrysanthemum carinatum* and *A. circinans* [*A. brassicicola*: ibid., xxv, p. 580] on *Godetia hybrida* seeds, both new hosts.

Chaudhuri [Chowdhury] (S. D.). **Appendix II. Annual Report of the Economic Botanist, Assam, for the year 1945–46.**—*Rep. Dep. Agric., Assam, 1945–46*, pp. 85–170, 1948.

In the section of this report (pp. 154–162) dealing with plant disease work in Assam (a summary of which appears on p. 30) during the period under review [cf. *R.A.M.*, xx, p. 447], it is stated that in one experiment at Mohgar in which Shillong potatoes were sprayed against early and late blights [*Alternaria solani* and *Phytophthora infestans*: ibid., xxvi, p. 562] with Bordeaux mixture (5–5–50, 4–4–50, and 2–2–50), two applications gave 40 per cent. more yield than one, but a third did not give any appreciable increase over two.

The percentage rotting [unspecified] developing in potatoes stored in heaps 2, 4, 6, and 8 in. high, with and without sand, was 52·79 for the Shillong variety as against 25·1 for Local. The average percentage rotting was 12·17, 29·1, 51·45, and 63·06 for the heaps 2, 4, 6, and 8 in. high, respectively. With sand the average amount of rotting was 32·95 per cent. and without sand 44·94, the difference between the two treatments being much less in Local. In the 2 in. heaps the percentage of rotting was the same for both varieties, whereas in those of 4, 6, and 8 in. it was higher in the Shillong. It is concluded that in storing potatoes the tubers should be spread in layers not more than 2 in. high, and preferably mixed with sand.

Complete control of rice leaf spot (*Helminthosporium oryzae*) [*Ophiobolus miyabeanus*: ibid., xxv, p. 317; xxvii, p. 294] was obtained by immersing the seed before sowing for 10 to 12 minutes in water maintained at 53° to 54° C. Under field conditions, however, there were secondary infections by the fungus from the soil, plant debris, and grasses. Infection by the agent of bunt [*Neovossia horrida*: ibid., xxiii, p. 119; xxvi, p. 265] was found to take place through the flowers.

On pineapple, *Ceratostomella paradoxa* [ibid., xxv, p. 460] caused leaf rot, base rot, and fruit rot, of which the last was the most serious, causing great damage. The fungus was ascertained to enter the fruit through wounds and the crevices between individual fruits. The fruit rot also develops seriously in storage when this has been carried out hurriedly.

Further studies on the fruit rot of jak [*Artocarpus integer*] caused by *Rhizopus artocarpi* [ibid., xxii, p. 53] showed that the optimum temperature for the growth of the fungus was between 26° and 28°, while no growth occurred at 7° and 33°. The organism grew between pH 3 and 8·4, with an optimum at 4·5. The parasite infected only male flowers and young immature fruits and was unable to attack

female flowers and mature fruits even after wounding. It lives saprophytically on plant debris, soil manure piles, and compost heaps. The chief agents of dissemination were wind, insects, and ants. Control consists in improved sanitation, and spraying the young fruits and male flowers with Bordeaux mixture (2–2–50) at intervals of 15 days during January, February, and March.

Southwell (G. A.). **British Honduras Department of Agriculture. Annual Report for 1946.**—67 pp., [? 1948.]

In the section of this report [cf. *R.A.M.*, xx, p. 125] dealing with plant diseases and pests it is stated that Sigatoka leaf spot (*Cercospora musae*) [*Mycosphaerella musicola*: ibid., xxvi, pp. 480, 529] still persists in banana areas and became more widespread in the Belize district towards the end of the year. It has not, however, caused any appreciable handicap to the local industry, as even poor fruit from infected areas was in demand.

Informativo sobre la labor y organización de la Estación Experimental de Pergamino con motivo de la visita de S. E. el Señor Ministro de Agricultura D. Juan Carlos Picazo Elordy. [Report on the work and organization of the Pergamino Experiment Station on the occasion of the visit of His Excellency the Minister of Agriculture, Don Juan Carlos Picazo Elordy.]—*Publ. Minist. Agric., B. Aires*, 22, 30 pp., 1946. [Received May, 1948.]

The following items may be noted in the section of this report dealing with phytopathology (pp. 15–20) presented by E. F. Godoy and O. Bruni. Flax crops have sustained increasingly heavy damage from 'soil sickness' [*R.A.M.*, xx, p. 18] since about 1900, when the disease was first observed in Argentina. Four years' laboratory and field experiments have led to the establishment of *Fusarium lini*, *Rhizoctonia* [*Corticium*] *solani*, and *Pythium ultimum* as the agents of the several manifestations of 'soil sickness'. Of these, *F. lini* is the exclusive source of wilt, *P. ultimum* the principal cause of failure to germinate, while *C. solani* is responsible for pre-emergence and damping-off injury. The severity and incidence of these pathogens vary in the different flax-growing regions, chiefly in relation to the following factors: date of sowing, age of plants, environmental conditions, crop rotation, season, and reactions of the varieties cultivated. A high degree of resistance to *F. lini* has been maintained by the varieties bred at Pergamino, which are, however, like the commercial types, susceptible to *P. ultimum*. *F. lini* is the main source of gaps in the stand resulting from losses of up to 40 or 50 per cent. of the seed sown. Six physiologic races of *C. solani* have been isolated from flax originating in different localities.

Flax rust (*Melampsora lini*) [ibid., xxvii, p. 67] passes the summer in the teleuto stage, producing spermogonia and aecidia during the autumn. These organs were recently observed in nature for the first time in Argentina. It has been shown that the immunity of a given variety from two physiologic races, e.g., 19 (the most prevalent) and 22, does not afford sufficient protection against rust epidemics, such as those artificially induced at the experiment station by the early sowing of susceptible varieties: it is necessary to develop immunity from race 42, which will automatically confer the same reaction to the less pathogenic races, 19, 22, and 40. Inoculation experiments have shown that only one fibre variety is immune from all the races hitherto detected in the country, while six varieties fall into the category of intermediate resistance [cf. ibid., xxvii, p. 133].

Environmental conditions favouring the development of 'pasmo' of flax (*Sphaerella linorum*) [loc. cit.] prevail in Argentina during the summer and autumn. The host is most susceptible to infection at the time of fruiting, so that the vegetative cycle of a particular variety influences its response to the pathogen at a given moment. Attempts are in progress to overcome the difficulties connected

with the assessment of resistance to *S. linorum* both in the field and in greenhouse inoculation tests.

Septoria nodorum and *S. tritici* have caused heavy damage on wheat [ibid., xxvi, p. 539] almost every year since 1939 in the north of the province of Buenos Aires, as well as in Santa Fé and Entre Rios; in 1943 and 1944 they occurred in epidemic form. *S. nodorum*, the more destructive of the two species, is particularly virulent in rainy springs and *S. tritici* in damp winters. The most widely grown cultivated varieties are very susceptible to the septorioses.

Gibberella saubinetii [*G. zeae*] has long been known in Argentina as an agent of ear blight which caused specially heavy losses in the Pergamino district in 1944, but not until 1945 did it assume its alternative form of foot rot, associated with the imperfect state of the fungus, *F. graminearum*. In that year it was responsible for deterioration in the wheat crops of northern Buenos Aires and southern Santa Fé, with resultant substantial reductions in yield.

THOMAS (R. C.). **A method for removing transmissible lysins from secondary cultures of bacteria.**—*Ohio J. Sci.*, xlviii, 3, pp. 102–106, 1948.

Many species of bacteria acquire lytic factors when they come into contact with the juices of higher plants, seed extracts, and plant residues [*R.A.M.*, xix, p. 653]. The presence of the lytic factor changes the metabolic activity of the organism. The studies described in the present paper show that transmissible lytic factors or bacterial viruses can be removed from bacteria and the organisms restored to their original form by using nucleic acids and plant extracts as adsorbants. Once rendered lysin-free, however, the organisms again become susceptible to lysis by the original lytic factor. Transmissible lysins for *Xanthomonas juglandis*, *X. stewarti*, *Erwinia carotovora*, *Corynebacterium michiganense*, *X. pruni*, and *Agrobacterium* [*Bacterium*] *tumefaciens* were obtained from oat extract, and for *C. sepedonicum* from potato haulm. With the exception of *X. pruni*, which could be rendered lysin-free by plating in nutrient agar, all the organisms retained their lysins in symbiotic relationship regardless of the number of transfers made in nutrient broth or agar. Thymus nucleic acid was effective for the removal of the lysins of *X. juglandis* and *Bact. tumefaciens*. Tomato plants were inoculated with cultures of *Bact. tumefaciens* with and without a lytic factor from oat extract being present, and it was found that the presence of such a lytic factor in the culture prevented the bacterium from developing galls whereas, after the lysin had been removed by treatment with timothy [*Phleum pratense*] extract, the culture was again susceptible to lysis and also regained the capacity to produce galls.

The methods outlined in this study may be applied to a culture suspected of having a transmissible lysin associated with it and the parent primary culture can frequently be recovered.

WERNHAM (C. C.). **The species value of pathogenicity in the genus Xanthomonas.**—*Phytopathology*, xxxviii, 4, pp. 283–291, 1948.

Pathogenicity was shown to be a remarkably specific character of 17 members of the genus *Xanthomonas* used in cross-inoculation tests on 16 taxonomically distinct hosts, viz., *X. campestris* on cabbage, *X. corylina* on *Corylus avellana*, *X. cucurbitae* on squash, *X. geranii* on *Geranium sanguineum*, *X. hederae* on ivy, *X. juglandis* on walnut (*Juglans regia*), *X. malvacearum* on cotton, *X. papavericola* on *Papaver rhoeas*, *X. phaseoli* and its var. *fuscans* on bean (*Phaseolus vulgaris*), *X. phaseoli* var. *sojense* on soy-bean, *X. pruni* on peach, *X. rubrilineans* and *X. vasculorum* on sugar-cane, *X. translucens* and its var. *undulosum* on barley and wheat, respectively, and *X. vesicatoria* on tomato. On the other hand, there was an almost complete absence of correlation between pathogenicity and the serological grouping of the species as reported by Elrod and Braun [*R.A.M.*, xxvii,

p. 276]. From the information at present available pathogenicity would appear to be of primary importance as a species determinant.

Bisset (K. A.). **The cytology of smooth and rough variation in bacteria.**—*J. gen. Microbiol.*, ii, 1, pp. 83–88, 2 pl., 10 figs., 1948.

A cytological study of various members of the genera *Bacterium* and *Bacillus* showed that the constituent bacteria of smooth cultures are typically unicellular, containing two chromatinic bodies. On division a membranous septum forms, the bacillus dividing by constriction at this point. The constituent bacteria of rough cultures may comprise several cellular units, typically four, each containing a single chromatinic body and separated by membranous septa which, as growth proceeds, are transformed into true cell-wall septa, by the splitting of which the bacillus divides.

Bondar (G.). **Podridão parda dos frutos de Cacau.** [Brown rot of Cacao pods.] —*Bol. fitossan. Minist. Agric., Rio de J.*, iii, 1, pp. 25–33, 2 figs., 1946. [Received May, 1948.]

Cacao brown rot (*Phytophthora palmivora*) is of little importance in Bahia, Brazil [*R.A.M.*, xx, p. 59] in normal seasons, when the minimum temperature does not sink below 15° C., but during the past decade the climate of the cacao-growing regions, especially near the coast, has been favourable to the pathogen to the great detriment of the crop. Night temperatures in June and July, 1945, fell to 12·3° and 12·2°, respectively, while on 10th July, 1944, a minimum of 9·7° was registered, with resultant reductions in yield of from 30 to 50 per cent. Protracted rainy periods, sometimes lasting two or three weeks, and overcast skies from April to June also favour the development of pod rot. A measure of control may be obtained by preventive treatments with Bordeaux mixture, as demonstrated by tests at the Experiment Station of the Cacao Institute, Uruçuca, but the most logical approach to the problem lies in the provision of tall shade trees to protect the cacao from the currents of cold air circulating on clear, starlit, winter nights following sunny days.

Nagel (C. M.). **Stem rust.**—*Ext. Leafl. S. Dak. agric. Exp. Sta.* 110, 12 pp., 9 figs., 2 diags., 5 maps, 1948.

This popular, illustrated leaflet emphasizes the importance of stem [black] rust [*Puccinia graminis*: *R.A.M.*, xxvii, pp. 64, 126] in the grain-growing areas of South Dakota and urges the need for co-operation in using all the known methods of control to reduce losses and keep the disease within bounds.

Detroux (L.). **Sur une méthode d'essai en laboratoire des désinfectants à sec pour semences.** [On a method for the laboratory testing of dust seed-treatments]—*C. R. I^er Congr. int. Phytopharm., 1946*, pp. 511–517, 1 pl. [? 1948.]

A new method for testing seed-dusting materials in the laboratory is described. The best substrate for culturing the chlamydospores of *Tilletia tritici* [*T. caries*: *R.A.M.*, xxvi, p. 484] (the organism used) was found to be a mixture of one part sand and two parts argillo-sandy soil moistened to 70 per cent. of its water-holding capacity. When it has been made sufficiently homogeneous, Petri dish covers are filled with it and the surface carefully smoothed and on a circular area 5 mm. in diameter 0·005 gm. of the fungicide under test is deposited, the dust being spread evenly by passing through the stem of a funnel of the same diameter. About 150 mg. of spores of *T. caries* are necessary as about two-thirds adheres to the dusting apparatus. They are dusted uniformly over the whole surface. The Petri dishes are incubated at 20° C. in darkness. Five or six days later germination of the

chlamydospores is in its characteristic phase. Round the deposit of fungicides having a high diffusive power there is a zone in which the spores do not germinate, the extent of which varies with the value of the disinfectant. The edges are often distinct, but in some cases the dead zone is followed by a further one in which germination gradually increases.

This method has been found very useful in estimating the factors N (near effect) and F (far effect), suggested by Gassner [ibid., vi, p. 278], for thioureated ethyl mercury chlorhydrate, mercury oxyethyl alkyl silicate, mercury phenylacetate plus mercury ethyl chloride, mercury phenyl urea, and ferric dimethyl thio-carbamate, all of which have a high diffusive power and inhibited germination 3·5 mm. or more beyond the fungicide deposit.

Grasso (V.). **Le specie di Tilletia del Frumento esistenti in Italia.** [The species of *Tilletia* present on Wheat in Italy.]—*R. C. Accad. Lincei*, Ser. viii, i, 12, pp. 1362–1364, 4 figs., 1946. [Received May, 1948.]

In addition to *Tilletia levis* and *T. tritici* [*T. foetida* and *T. caries*, respectively: *R.A.M.*, xxvi, p. 50] on wheat in Italy the author also found *T. triticoides* [ibid., xxii, p. 14 and next abstract] and *T. intermedia* [ibid., xviii, p. 303] to be associated with bunt. *T. triticoides* occurs in 20 provinces and is prevalent in nine, mainly in the north and on the varieties Salto, Modaro 218, Frassineto, Rieti, and Virgilio. Its spores measure 18·25 to 20·4 μ in diameter and the ridges of the reticulate wall are 0·5 to 0·7 μ high with 45 to 55 areolae, each 5·4 to 6·3 μ across. Although these reticulations are mostly equal in size and number to those of *T. caries*, they frequently numbered 65. *T. triticoides* may occur alone or associated with the other three species.

T. intermedia was found in ten provinces but was prevalent in none, being rarer than *T. caries*. The spores measure 17·6 to 18 μ in diameter, ridges of the finely reticulate wall being 0·2 to 0·1 μ high, and the areolae numbering from 100 to 180. Spores 21·1 to 22·2 μ in diameter have been found on some varieties. *T. intermedia* was always accompanied by one or more of the other species; it did not occur with *T. foetida* alone, however, but with *T. caries* as well.

Săvulescu (T.) & Hulea (Ana). **Nuovi contributi allo studio della carie del Frumento.** [New contributions to the study of Wheat bunt.]—*Bull. Sect. sci. Acad. roum.*, xxvi, 6, pp. 409–422, 7 pl., 1944. [Received April, 1948.]

In studies on wheat bunt in Rumania [*R.A.M.*, xxiii, p. 142], *Tilletia tritici* [*T. caries*], *T. triticoides* [see preceding abstract], *T. intermedia* [loc. cit.], and *T. foetens* [*T. foetida*] were found separately or in mixtures of two, three, or all four, in the same plant, the same culm, the same spike, the same spikelet, or the same caryopsis, whether totally or partially infected.

Examination of partially infected caryopses showed how they became infected, the mycelium spreading from the peduncle and passing between the pericarp and the testa. The different appearances of different infected caryopses are related to the time when they became infected. If infection occurs before fertilization or immediately after, the fungus completely fills the ovary, the embryo and endosperm ceasing to develop. If infection takes place later the fungus penetrates the caryopsis and gives it the appearance of a partially bunted grain, the embryo and endosperm appearing deformed.

The percentage of partially infected caryopses, though small compared with those completely bunted, is nevertheless high enough to ensure a state of persistent infection even after the grain has received fungicidal treatment, especially if dusts are used. Liquid treatments attack the chlamydospores present in partially bunted caryopses, and are, therefore, more active than dusts.

Lowther (C. V.). **Low temperature as a factor in the germination of dwarf bunt chlamydospores.**—*Phytopathology*, xxxviii, 4, pp. 309–310, 1948.

Holton has shown that the chlamydospores of wheat dwarf bunt (*Tilletia caries*) may be induced to germinate by several months' immersion in water prior to incubation on water agar [*R.A.M.*, xxiii, p. 10]. Up to 30 per cent. germination has been obtained by this method when the spores were incubated at 10° C. but none at higher temperatures. Tests were accordingly carried out in 1947 to determine whether still lower temperatures would promote germination, using eight collections of the pathogen from the Pacific Northwest which had been stored at room temperature for periods of 3 to 13 years. Without pre-soaking the spores were placed on 4 per cent. water agar in Petri dishes at 0°, 5°, and 10°, and germination counts were made after 49, 70, and 104 days, when the experiments were concluded.

The optimum temperature for germination was found to be 5°, which permitted up to 50 per cent. in 49 days and 75 per cent. by the end of 70, after which there was no further increase. No germination occurred at 10°. In other tests, a high percentage of germination was obtained at 0° after three months. In preliminary experiments spores of several 1947 collections germinated well at 5°, indicating that age does not influence the process in the case of *T. caries*.

Ekstrand (H.). **Några växtpatologiska synpunkter på övervintringen av höstsäd och vallgräs med särskild hänsyn till försöksverksamheten inom jordbruket.** [Some phytopathological aspects of the overwintering of autumn cereals and forage grasses with special reference to experimental work in agriculture.]—*Medd. Växtskyddsanst., Stockh.*, 49, 48 pp., 1 fig., 1947. [English summary.]

This is a summary of ten years' (1937 to 1947) contributions by the author and others to the phytopathological aspects of the overwintering of autumn cereals and forage grasses in Sweden [*R.A.M.*, xxvi, p. 297 and next abstract]. It appears from extensive tests carried out in different localities that rye losses due to *Calonectria graminicola* were generally much less severe when treated seed was used. Seed dressing is considered to be essential for overwintering cereal and forage crops although it caused little reduction in rye losses from *Sclerotinia borealis* while those due to *Typhula borealis* were higher after seed treatment. However, the author stresses the importance of seed infection by *C. graminicola* as this is related to losses from snow mould damage even among the more resistant varieties. He suggests that the analysis certificate from the Seed Control Station should state the degree of seed infection for non-dressed seed.

In conclusion it is recommended that dressed seed with low snow-mould infection from resistant varieties grown in the cultivation area should be used, attention being paid to suitable fertilizers, particularly phosphate. In further breeding programmes resistance to winter fungi should be considered and selection work carried out locally.

Ekstrand (H.). **Höstsäden och vinterhärdighetsproblemet med särskild hänsyn till resistensen mot vissa svampsjuksdomar.** [Autumn cereals and the problem of winter-hardiness, with special reference to certain fungal diseases.]—*Medd. Växtskyddsanst., Stockh.*, 50, 28 pp., 1947. [English summary.]

This is a summary to date of the work still in progress at the Swedish Plant Protection Institute on winter-hardiness in autumn cereals, especially in regard to resistance to certain fungal diseases. The author concludes that the northern limit for winter cereals in Sweden is determined by the winter pathogenic fungi. By breeding varieties resistant to these the area of cultivation may be considerably extended northwards. In some years *Sclerotinia borealis* plays the chief part, in

others *Fusarium nivale* [*Calonectria graminicola*] or *Typhula* spp., or they may all occur together. The literature cited includes ten years' contributions by the author [see preceding abstract] and a number of other papers bearing on the subject.

Christensen (C. M.) & Gordon (Dorothy R.). **The mold flora of stored Wheat and Corn and its relation to heating of moist grain.**—*Cereal Chem.*, xxv, 1, pp. 40–51, 1948.

All the samples of maize, numbering 135, and several of wheat collected in 1945 and 1946 from commercial lots for examination at the Minnesota Agricultural Experiment Station, were found to harbour moulds capable of growth at relatively low moisture contents [cf. *R.A.M.*, xxvii, p. 147]. The number of moulds on maize increased with rising moisture content of the seed, averaging for instance in the 1945 crop 12,000 per gm. at 14 per cent. and 940,000 at 23 per cent. In general, the same species were found as reported by previous workers, e.g., *Fusarium moniliforme* [*Gibberella fujikuroi*], *Nigrospora sphaerica*, *Diplodia zeae*, *Cephalosporium acremonium*, *Penicillium* spp., *Aspergillus candidus*, *A. flavus*, *A. niger*, *A. fumigatus*, and *A. versicolor*, *Mucor* spp., and *Hormodendrum* spp. *Monilia candida* [*Candida* sp.] predominated in seven of the 15 samples of 1946, forming an inconspicuous or barely visible crust on the seed surfaces. When present to the extent of several hundred thousand per gm. it imparted a decidedly sour and unpleasant, yeasty odour to the seed. The organism appears to make fairly rapid growth on samples with moisture contents of 22 to 25 per cent., its development being inhibited, however, below 20. It is, moreover, a facultative anaerobe, capable of slow growth in moist maize stored in an atmosphere of carbon dioxide. *Candida* spp. were later found on various other lots of maize of the 1946 and 1947 crops.

A. glaucus, *A. candidus*, and *A. ochraceus* were the principal inhabitants of the wheat samples, with the addition in the case of 'sick' material of *A. niger*, *A. flavus*, *P.* spp., and *M.* spp. [ibid., xxvi, p. 239].

After nearly a year's dry storage, maize of the 1945 crop bearing a fairly heavy and varied natural mould flora was moistened to six different water contents and 200 gm. placed in pint vacuum bottles (two for each content). At 16 per cent. water content the temperatures of the samples after 4 and 12 days were 24° and 24° C., respectively, the associated mould being *A. glaucus*; at 18 per cent. 25° and 26° (*A. glaucus*); at 20 per cent. 26° and 29° (mostly *A. glaucus*, some *A. candidus*); at 22 per cent. 35° and 50° (*Mucor*, *A. flavus*, *A. candidus*), at 24 per cent. 33° and 50° (*A. terreus* and *A. flavus*); and at 26 per cent. 45° and 53° (*A. fumigatus*).

To determine the effect of certain species on the heating of moist maize, spores were inoculated on to autoclaved maize conditioned to various moisture contents with hot sterile water after placing in sterile vacuum bottles. The temperature of the samples dropped to that of the room (22° to 25°) in 24 hours. After 4 and 20 days the temperatures of the lots inoculated with *A. candidus* at 18 to 19, 20 to 21, and 22 to 23 per cent. moisture were 40° and 44°, 42° and 44°, and 45° and 45°, respectively; with *A. flavus* at the first two moisture contents, 46° and 45°, and 43° and 43°; and with *P.* spp., 29° and 34°, 29° and 34°, and 28° and 35°. In another experiment after 12 days the temperatures of the samples inoculated with *A. candidus* at 14, 16, 18, 20, and 22 per cent. moisture content were 20°, 21°, 26°, 43°, and 40°, respectively; with *A. flavus* (first four contents) 22°, 22°, 22°, and 41°; and with *A. terreus* 20°, 20°, 21°, 34°, and 44°. The temperature of the uninoculated controls after the same period at 14, 18, and 22 per cent. moisture content was 21°.

Samples of two wheat varieties, Marquis nine years old from Montana, germinating 90 per cent. but with signs of declining viability, and one-year-old Rival

from Minnesota, germinating 95 per cent. with normal vigour, were conditioned to moisture contents of 20, 22·5, and 25 per cent. and stored for 11 days at 22° to 23°. At the close of the test the temperatures of Marquis and Rival at 20 per cent. were 25° and 23·5°, respectively, and the numbers of moulds per gm. 720,000 and 880,000, respectively, *A. glaucus* predominating in both varieties; at 22·5 per cent. the corresponding figures were 25° and 25° and 2,235,000 and 1,623,000, *A. glaucus* and *Penicillium* being most prevalent in Marquis and *Penicillium* and *A. candidus* in Rival; and at 25 per cent., 39° and 29° and 173,000,000 and 5,150,000, respectively (mostly *A. flavus* in both lots).

When autoclaved Rival wheat was inoculated at a moisture content of 30 per cent. with *A. glaucus*, the temperature of the samples after eight days had risen from that of the room to 38°, with *A. candidus* to 47°, and with *A. flavus* to 45°. In another test on surface-disinfected hybrid Montana at 30 per cent. moisture content, *A. glaucus* caused heating up to 28° and 31° after 5 and 14 days, respectively, and *A. candidus* and *A. flavus* to 45° and 46°, respectively.

None of the six disinfectants tested was effective in the prevention of mould development in moist wheat. Thiourea [ibid., xxvii, p. 147] permitted a vigorous growth and sporulation of *A. candidus*, while apparently inhibiting almost completely the development of other species.

GARRET (S. D.). **Soil conditions and the take-all disease of Wheat. IX. Interaction between host plant nutrition, disease escape, and disease resistance.**—*Ann. appl. Biol.*, xxxv, 1, pp. 14–17, 1948.

The results of field experiments carried out at Rothamsted in 1945 and 1946 showed that the application of nitrogen or a combined dressing of phosphate and potash reduced the incidence of 'take-all' (*Ophiobolus graminis*) [*R.A.M.*, xxvi, p. 50; xxvii, p. 182] on barley, the percentage disease rating for 1945 being 23 and 27 for the two treatments, respectively, the corresponding figures for 1946 being 35 and 33 compared with 39 for the control in each year. It is suggested that manuring enables the plants to produce new crown roots more quickly than the pathogen can infect them [cf. ibid., xxvii, p. 14]. These data are, however, apparently at variance with those reported in an earlier pot-culture experiment [ibid., xx, p. 250], but in that experiment the operation of the disease-escape mechanism was inadvertently affected by inoculation at the crown and by environmental conditions in the glasshouse exceptionally favourable to infection. The likelihood of new crown roots escaping infection dwindles with the approach of *O. graminis* to the crown, the speed of approach depending upon the concentration and distribution of inoculum in the soil and the growth rate of runner hyphae along the roots, which varies with soil conditions. In the above-mentioned experiment the disease rating was reduced by nearly a half in pots receiving one-third nitrogen in the presence of full phosphorus and potassium. The author concludes that an increased nitrogen supply may increase the susceptibility of individual roots to the disease, but at the same time promotes infection escape and increases grain yield.

OBERHOLZER (P. C. J.). **The Bitter Seville rootstock problem.**—*Fmg S. Afr.*, xxii, 255, pp. 489–495, 5 figs., 1947.

From his investigations carried out during the past few years in Pretoria the author tentatively concludes that the incompatibility reactions shown by certain stock-scion combinations of citrus in South Africa are probably due to a virus. This would seem to be present in a latent form in certain species or varieties, such as Valencia orange, and to set up pathological conditions only when certain stock-scion combinations are made. The virus would appear to be eliminated (at least temporarily) by taking the infected, but apparently healthy, scion variety through

the seed, using the well-established principle of nucellar embryony characteristic of citrus. This relatively simple method permits the maintenance of the inherent genetic constitution of a particular variety by eliminating the sexual variant hitherto used almost exclusively for rootstock selection. By using buds from such nucellar seedlings, healthy and highly vigorous budlings have been produced of formerly incompatible combinations, such as Valencia orange on sour orange and lemon rootstocks. The insertion of buds of the particular scion variety (e.g., Valencia orange) from a normal budded orchard tree into such healthy seedlings produces infection relatively soon, accompanied by typical symptoms of decline and root decay.

The evidence available indicates that the incompatibility reactions observed in South Africa, Java, and India, particularly so far as the sour orange is concerned, are probably directly related to the problem of 'tristeza' [root rot] [*R.A.M.*, xxvii, p. 129] and quick decline [ibid., xxvii, p. 233 and next abstract], each of which is probably due to a virus. This virus would seem to be infectious, being distributed in other ways as well as by budding.

McAlpin (D. M.). **'Bud-union decline' disease of citrus trees.**—*J. Dep. Agric. Vict.*, xlvi, 5, p. 236, 1948.

Bud-union decline disease [*R.A.M.*, xxvii, p. 320 and preceding abstract] in Victoria appears to be similar to 'quick decline' in California, 'tristeza' in South America, and 'incompatibility' in South Africa and is taking a heavy toll of orange and grapefruit trees budded on sour orange or Seville rootstocks. The rate of spread in Victoria indicates that some agent apart from budding is carrying the disease from one plant to another but no such agent is known.

Sergent (E.). **Nécessité et efficacité de barrières sanitaires au Sahara. Deux exemples : la peste bovine et le baïoudh du Dattier.** [Necessity and efficacy of quarantines in the Sahara. Two examples: cattle plague and the Date 'baïoudh'.]—*Arch. Inst. Pasteur Algér.*, xxvi, 1, pp. 1–9, 1 map, 1948.

Stringent quarantine measures are called for to protect the oases of the north-eastern Sahara from the ravages of the 'baïoudh' disease of date palms (*Cylindrophora albedinis*) [*R.A.M.*, xxvi, p. 53], which is believed to have originated at Draa (south-western Morocco), spread to the Tafilalet, and then, about 1898, to Figuig. The progress of the disease is slow but continuous, every infected palm is doomed, and replacements in their turn become contaminated through the soil and die. The natives are already trying to arrest the spread of the fungus by the exclusion from healthy oases of all material from infected areas, even palm wood in the form of structural timber, as well as manure, agricultural implements, and the like.

Mayne (W. W.). **A note on Coffee research in South India.**—72 pp., Bangalore, Indian Coffee Board, 1946. Rs.2.8, 3*s.* 6*d.* [Received June, 1948.]

This memorandum is a part of a report submitted to the Indian Coffee Board and comprises a detailed programme for the organization of coffee research in South India.

In Chapter VI (pp. 29–34), dealing with disease control and the spraying experiments in progress, the author states that the principal diseases affecting coffee crops in South India, namely, leaf rust (*Hemileia vastatrix*) [*R.A.M.*, xxvi, p. 199], black rot (*Corticium koleroga*) [ibid., xxvi, p. 104], and die-back (associated with, but doubtfully caused by, *Colletotrichum coffeanum*) [*Glomerella cingulata*: ibid., xv, pp. 17, 798], can be effectively controlled by spraying with Bordeaux mixture.

In Chapter VIII (pp. 38–45) the problems associated with breeding coffee selections having a wider range of resistance to the various strains of *H. vastatrix* [ibid., xv, p. 798] are discussed. Although there are many selections resistant to the physiologic races of the fungus now prevailing they are susceptible to others which may become common. Investigation into the mode of inheritance of disease resistance and the development of field trials of selections are suggested.

A summary of the technical programme is appended.

Karling (J. S.). **Chytridiosis of scale insects.**—*Amer. J. Bot.*, xxxv, 4, pp. 246–254, 49 figs., 1948.

Investigations of infected female scale insects, *Lepidosaphes beckii* and *L. newsteadi*, found on citrus and cedar (*Juniperus bermudiana*) trees by Dr. J. M. Waterston in Bermuda in January, 1947, showed that the insects suffered from chytridiosis caused by a parasite which appears to be identical with *Myiophagus ucrainicus* [*R.A.M.*, xxi, p. 15; xxiv, p. 341]. A full description of the structure and life-history of the organism is given. Abundant material was found by the author on *L. beckii* on orange trees in Louisiana, and by Waterston on *L. ulmi* on apple twigs at Belleville, Ontario, Canada. The parasite may be transferred experimentally to mealy bugs, *Pseudococcus longispinus* and *P. citri*.

Up to 45 per cent. of heavily infected *L. beckii* on sour orange twigs were killed by the fungus. Infection was extended easily by spraying infected twigs with water. The branched or unbranched, endobiotic, elongate, lagenidioid, septate, non-rhizoidal thallus has conspicuous constrictions at the septa. It forms at maturity linear series of sporangia usually separated by distinct isthmuses of variable size. As the isthmuses disintegrate, golden-orange sporangia separate and lie free in the insect's body. When placed in water posteriorly uniflagellate zoospores emerge through one to five papillae. No resting spores were observed and no comparison on that basis with *M. ucrainicus* could be made. It is suggested that the parasite might be used for the biological control of the Bermuda cedar scale insects which threaten to exterminate the tree.

Drechsler (C.). **Three Zoopagaceae that subsist by capturing soil amoebae.**—*Mycologia*, xl, 1, pp. 85–105, 4 pl., 1948.

The morphology and behaviour are described of three more new members of the Zoöpagaceae [*R.A.M.*, xxvi, p. 545]: *Acaulopage baculispora* n. sp., *A. gyrinodes* n. sp., and *Stylopage rhicnacra* n. sp., consuming amoebae on decaying vegetable matter.

Batallanez (R. H.). **Presencia de la 'antracnosis' del Lino en la República Argentina.** [Anthracnose of Flax in the Argentine Republic.]—*Publ. Estac. exp. Pergamino 23*, 34 pp., 5 pl. (1 col.), 1947. [English summary.]

During September, 1943, anthracnose or canker caused by *Colletotrichum lini* [*C. linicola*: *R.A.M.*, xxvi, pp. 404, 453] was found for the first time in Argentina on leaves and stems of flax plants at the Rafaela Experimental Farm (Province of Santa Fé), on the variety Bombay at the National Experiment Station, Pergamino, and in flax straw from Encarnación (Paraguay). As yet the disease has been determined neither in field crops nor in the form of seedling blight.

The pathogenicity of the fungus was established by sowing flax seed in anthracnose-infested soil and by sprinkling the plants with a suspension of conidia. As the disease appeared only on foreign varieties it probably arrived on seed samples. Close control measures, based on those used abroad, are recommended to prevent any further dissemination. A full description of the fungus is given and the reactions of 60 flax varieties to it are listed.

Andrén (F.). **Betningsförsök med Lin och Hampa.** [Disinfection experiments with Flax and Hemp.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1947*, 6, pp. 85–87, 1947.

Further experiments in flax and hemp seed disinfection were carried out at the Plant Protection Institute, Stockholm, in 1946 and 1947 [*R.A.M.*, xxv, p. 501]. In the former year the maximum increases of 23·3 and 21·4 per cent. in the germinability of flax were secured, respectively, with panogén (300 ml. per kg.) and lunasan (0·54 per cent. mercury) at a dosage of 300 gm. In the case of hemp the maximum increases of 14·4 and 14·3 per cent. were given by the panogén and U.T. 1875 b (300 gm.) treatments, respectively, followed by betoxin 61 (300 gm.) with 13·6 per cent.

In 1947 several non-mercurial preparations were included in the tests, e.g., phygon, fermate, zerlate, spergon (all at 300 gm.) and TMTD [tetramethyl thiuram disulphide] emulsion (300 ml.), of which the first-named gave particularly good results on flax, increasing germinability by 69·2 per cent. The maximum values of 83·3 and 79·6 per cent., however, were obtained with aagrano (300 gm.) and panogén (300 ml.), respectively, and in general the mercury-containing fungicides gave larger increases than the non-mercurial (differences of 14 and 6 per cent., respectively, for flax and hemp). Aagrano was also the most effective treatment for hemp seed, enhancing germinability by 98·1 per cent., while the next best was lunasan (0·75 per cent. mercury, 300 gm.) with 89 per cent.

Espino (R. C.) & Ocfemia (G. O.). **An additional insect vector of bunchy-top of Abacá or Manila Hemp plant.**—*Philipp. Agric.*, xxxi, 3, p. 231, 1 fig., 1948.

Using experimental methods previously described by Ocfemia [*R.A.M.*, ix, p. 384], Espino found that the aphid *Pentalonia caladii*, collected on *Caladium bicolor*, could transmit the [abaca] bunchy-top virus from diseased to healthy abaca [*Musa textilis*] plants [ibid., xxvii, p. 236]. All copies of the thesis embodying the results of the work were burnt during the war in February 1945.

Abaca appears to be a relatively uncongenial host of *P. caladii*, which at the moment is of no great importance as a carrier under field conditions. The aphid may, however, gradually adapt itself to feeding on abaca and acquire greater significance in the transmission of the virus.

Holmes (F. O.). **Elimination of spotted wilt from a stock of Dahlia.**—Abs. in *Phytopathology*, xxxviii, 4, p. 314, 1948.

The [tomato] spotted wilt [virus] occurred in an exceptionally severe form in dahlia plantings in New Jersey in 1946 [cf. *R.A.M.*, xiv, p. 201; xix, p. 255], the Rhythm variety sustaining particularly heavy damage, every plant being attacked. The lower leaves of all varieties suffered more than the upper ones. Shoots grown from diseased roots generally looked healthy at first, though if left attached to the old roots they eventually developed infection. Tip cuttings taken from emerging shoots were readily rooted, and only a few showed spotted wilt symptoms when established as potted plants, while 30 made vigorous growth throughout the summer in a field plot. In no case did the disease reappear, indicating that this particular stock had been freed of virus by the drastic removal of infected tissues, i.e., old roots, stems, and lower leaves.

McKnight (T.). **Scab disease of Gladiolus.**—*Qd agric. J.*, lxvi, 2, pp. 104–105, 2 figs., 1948.

A brief popular account is given of *Gladiolus* scab (*Bacterium marginatum*) [*R.A.M.*, xxv, p. 303; xxvi, pp. 58, 453], the major disease of this host in Queensland, where it has caused much concern to growers during the past few years.

In 1947 the neck rot stage appeared in some plantings. A four- to five-year rotation is recommended, together with disinfection of the corms by 12 hours' immersion in 1 in 1,000 mercuric chloride solution, after which they should be washed in running water and planted immediately.

Tunblad (B.). **Ett bekämpningsförsök mot mjöldagg på Begonia.** [A control experiment against mildew on Begonia.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1947*, 2, pp. 24–27, 1 fig., 1947.

In a small-scale test on *Begonia* plants of the Eges Favorit variety in 1946–7, satisfactory control of mildew [*Erysiphe polyphaga*, the collective name proposed for a number of species including *Oidium begoniae*: *R.A.M.*, xxv, p. 343] was obtained by treatment with three oil emulsions, viz., 1·5 per cent. panikol (Wikholms technical factory, Stockholm), 1 per cent. F.D. white oil (ultramare), and 1·5 per cent. olana (Gehlin. seedsman, Malmö). Applications were made on 12th and 23rd November and 21st December. On 14th January the sprayed plants were completely free from mildew and the fungus had been killed on the few lesions remaining after the earlier treatments.

Zobrist (L.). **Nouvelles expériences dans le domaine de la protection des plantes ornementales.** [New experiments in the domain of the protection of ornamental plants.]—*C. R. Ier Congr. int. Phytopharm., 1946*, pp. 319–325, 6 figs. [? 1948.]

The author points out that in the treatment of ornamentals against fungal disease two considerations have to be borne in mind, viz., the susceptibility of many plants to copper injury and the fact that the product used must leave no unsightly deposit. The combination of 0·1 per cent. copper carbonate with 0·4 per cent. rotenone emulsion gives a mixture of lasting fungicidal efficacy which also acts as an insecticide and leaves a scarcely perceptible film. The mixture can be used with safety both preventively and curatively against *Oidium begoniae* [see preceding abstract] on Gloire de Lorraine begonias, even when they are in full flower. The same treatment can be used against *Oidium* of *Chrysanthemum indicum* [*O. chrysanthemi*: *R.A.M.*, xxii, p. 25; xxiii, p. 179], of *Hydrangea opuloides* [*Microsphaera polonica*; ibid., xii, p. 642], of *Euonymus japonica* [*O. euonymi-japonicae*: ibid., xxvi, p. 317], of Bella Donna *Delphinium* [*Erysiphe polygoni*: ibid., xxv, p. 578], of vine [*Uncinula necator*: ibid., xxvi, pp. 326, 377], and of cucumber [*E. cichoracearum*: ibid., xxiii, pp. 161, 253; xxiv, p. 263]. It can also be employed preventively, if the concentration of copper carbonate is raised to 0·3 per cent., against leaf spots of ornamentals due to *Alternaria*, *Cercospora*, *Entyloma*, *Phyllosticta*, *Ramularia*, and *Septoria* spp., as well as other fungi. If the mixture is used preventively, it should be applied every month, while for curative purposes two applications should be made at an interval of four to six days followed by further treatments every three or four weeks. The mixture caused no damage to any species of plant so far tested. On roses it can be used against *Sphaerotheca pannosa* var. *rosae* [ibid., xxiii, p. 90] and *Phragmidium subcorticum* [*P. mucronatum*: loc. cit.], but certain copper-sensitive varieties, e.g., Lancaster and York, and Maiden's Blush, as well as *Rosa canina* and *R. laxa*, cannot tolerate even weak doses.

Stuart (N. W.). **The effects of ceresan dips and fertilizer applications on growth, flower production, and basal rot development in Narcissus.**—*Proc. Amer. Soc. hort. Sci.*, 1, pp. 411–415, 1947.

In 1941, at the Plant Industry Station, Beltsville, Maryland, King Alfred narcissus [daffodil: *Narcissus pseudonarcissus*] bulbs were dipped in July and September in ceresan (1 lb. to 40 gals. water) and planted with the same number of undipped bulbs in beds to each of which was added 1 lb. of a nitrogen-phosphorus-

potassium fertilizer (4–8–8). Two levels of each element were used, none and the full amount. When the bulbs were harvested in July, 1942, those showing basal rot (*Fusarium oxysporum* f. *narcissi*) [*F. bulbigenum*: *R.A.M.*, xxvi, p. 302] were removed, and half of the sound ones were dipped in new improved ceresan. The bulbs were then dried in the sun and stored until September when they were again sorted for basal rot. Those double-dipped in ceresan in 1941 were given a planting dip in 1942, while the undipped were not. The same fertilizer treatments were used. These harvesting, pre-planting, and fertilizer treatments were continued in 1943 and 1944.

The weights of the undipped bulbs for the three years 1942–4 were 122·9, 122·8, and 109·6 lb., respectively; for those receiving a harvest dip only 138·2, 208·4, and 258·3; those double-dipped in ceresan in 1941 and receiving only a single planting dip thereafter 191·4, 328·8, and 394·8; while those double-dipped annually yielded 200·7, 333, and 415·1 lb. Nitrogen and to a lesser extent phosphorus reduced the weight and number of bulbs and number of flowers, and favoured the development of basal rot. Potassium, on the other hand, significantly increased the yields and reduced the incidence of the disease. These results are in agreement with those of cultural studies on the nutrition of *F. bulbigenum* [loc. cit.] and suggest that many fertilizer treatments are of greater benefit to the basal rot fungus than to the daffodil.

Hulea (Ana). **La pourriture des capitules de Tournesol.** [Rot of Sunflower heads.] —*Bull. Sect. sci. Acad. roum.*, xxiii, 10, pp. 558–568, 7 figs., 1941. [Received April, 1948.]

Most of the information in this paper dealing with root, collar, and head rot of sunflowers in Rumania, caused by *Sclerotinia libertiana* [*S. sclerotiorum*: *R.A.M.*, xxiii, p. 250] has already been noticed from another source [ibid., xxi, p. 405]. In the present paper it is stated that the rotting of the sunflower heads was ascertained to be due to a conidial form, *Botrytis vulgaris* [*B. cinerea*].

Cejp (K.). **Rozšiřování hub mravenci.**—[Dissemination of fungi by ants.]—*Čes. Mykol.*, i, 3, pp. 78–80, 1947.

During his investigations in Czechoslovakia into blight of peonies [*R.A.M.*, xxii, p. 170] and its transmission by ant vectors, in 1946, the author found that Belle of France, Irma, Antoine Porteau, and Paradise were especially susceptible to the disease. Isolations on agar from the infrabuccal pellets of a *Myrmica* sp. (? *M. rubra*) and *Lasius fuliginosus* found on a Chinese peony showing typical blight symptoms, yielded a *Botrytis* sp. identical with *B. paeoniae*.

Kuntay (S.) & Bremer (H.). **Bir çayır otunda evcil hayvanları zehirleyen mantar.** [A parasite fungus on pasture grass poisoning livestock.]—*Zir. Derg., 1947*, pp. 4–6, 1 fig., 1947. [English summary.]

The occurrence of *Claviceps paspali* [*R.A.M.*, xx, p. 23] on *Paspalum distichum* has been reported for the first time from south-western Anatolia, Turkey; it caused poisoning of grazing cattle. A brief description is given of the organism, its geographical distribution and host range, the way to avoid poisoning, and remedial measures.

Scott (C. E.). **Field tests of fruit trees for micronutrient deficiencies. Part II.** —*Agric. Chemicals*, iii, 5, pp. 35–39, 1948.

Part I of this article gives a general popular introduction to trace element deficiencies (*Agric. Chemicals*, iii, 4, pp. 30–32, 75, 1948). In Part II it is stated that different species and varieties of fruit trees in California differ greatly in their

susceptibility to trace element deficiencies [*R.A.M.*, xxv, p. 80], particularly of boron, zinc, copper, manganese, and iron. A summary of the corrective treatments for deficiencies of the various elements, together with some results, is given. In most cases limb injection with dry salt or spraying alleviates the deficiency: soil treatments are recommended only in the case of boron.

Mulder (D.). **Carences zinciques chez les arbres fruitiers en Europe.** [Zinc deficiencies in fruit trees in Europe.]—*C. R. Acad. Agric. Fr.*, xxxiv, 3, pp. 177–178, 1948.

In 1943, the author observed an apparently new disease of Golden Delicious apple trees in Holland which experimental evidence later demonstrated was due to zinc deficiency [cf. *R.A.M.*, xxiii, p. 491; xxiv, p. 421]. The same trouble has been reported from Switzerland, and the author has also seen it in Denmark. On Golden Delicious the symptoms appear as scattered yellow spots on fully grown leaves, while those still developing show a yellow discoloration, though the main veins are green. The edge of the leaf is undulating and the leaves are small and narrow. On the branches, the distances between the internodes at the extremity are much shortened, a rosette formation resulting. Maturation at the ends of the branch is delayed and terminal bud formation retarded. The branches remain too flexible and a witches' broom is produced. The fruits remain small. Pears and cherries are also affected. In Holland, the condition has been noted in the Zeeland islands and once in North Brabant.

Thomas (W.), Mack (W. B.), & Fagan (F. N.). **Foliar diagnosis : internal bark necrosis in young Apple trees.**—*Proc. Amer. Soc. hort. Sci.*, l, pp. 1–9, 6 figs., 1 graph, 1947.

This study, published as paper No. 1382 in the Journal Series of the Pennsylvania Agricultural Experiment Station, deals with investigations into the bark abnormalities exhibited in 1944 and 1945 by young Stayman, Delicious, and Rome apple trees planted in 1941, the symptoms of which resembled those of the internal bark necrosis [*R.A.M.*, xxvi, p. 16].

The results of foliar diagnosis tests showed that the severity of the disorder was not associated with the concentration of iron, boron, or manganese in the leaves, which was normal. The nitrogen-phosphoric acid ratio, however, was found to be unbalanced and a correlation existed between the extent of the unbalance and the severity of the symptoms.

Guyon (G.). **Diagnostic de carence azotée du Pommier par l'analyse de la feuille. Vérification expérimentale.** [Diagnosis of nitrogen deficiency in the Apple tree by foliar analysis. Experimental verification.]—*C. R. Acad. Sci., Paris*, ccxxv, 23, pp. 1174–1175, 1947.

Canada Pippin apple trees in orchards on meadowland in Auvergne have been suffering for some years from a disorder known locally as 'dying off' or 'red wood disease', symptoms of which include small, scanty, pale green leaves, failure of lateral and terminal twig production, reddening of the cortex of lateral branches exposed to the sun, and a poor fruit harvest. In severe cases there is a progressive die-back of the main branches from the tip to the base. Affected trees die within a few years.

In 1946 a series of experiments was initiated using various fertilizers including nitrogen. On 26th June the nitrogen contents (expressed as percentages of dry matter) of diseased and healthy leaves were 1·55 and 2·75, respectively, the corresponding figures on 2nd September being 1·44 and 2·22, respectively, while the weights of 100 dry leaves (in gm.) were 11 and 30 for the diseased and healthy, respectively, on the former date, and 14 and 34, respectively, on the latter. Not

until 1947 did the trees begin to respond to continued heavy applications of nitrogen at intervals by the development of large, green leaves, fruit production, and the formation of new shoots. In August and September the nitrogen percentages of trees in the course of recovery were 2·12 and 2·11, respectively, the corresponding figures for cases of complete cure after two years of treatment being 2·92 and 2·22, respectively. In another test in 1947 diseased trees reacted favourably to early spring injections of ammonium nitrate (5 gm. per l.) into holes bored in the trunk.

Numerous analyses have shown that Canada Pippins in meadowland orchards develop typical symptoms of nitrogen deficiency as soon as the nitrogen percentage of leaves collected in August falls below 2 per cent. instead of the normal 2·30 per cent. and upwards. The rehabilitation of the affected orchards would require an annual outlay of 150 to 250 kg. nitrogen per ha. over a period of several years in succession.

Gaudineau (Mlle M.). **Maladies du Pommier et du Poirier. Quelques questions d'actualité.** [Diseases of Apple and Pear trees. Some present-day problems.] —*C. R. Synd. Arboric. Adour, 1947*, 6 pp., 1 fig., 1947.

In this paper are presented the symptoms, biology, host range, and methods of controlling the principal diseases of apples and pears in France, including a few which have increased since 1942, viz., leaf spot of pear (*Mycosphaerella sentina*) [*R.A.M.*, xxvi, pp. 64, 247], *Oidium* [powdery mildew] of pear and apple (*Podosphaera leucotricha*), and apple leaf spot (*Sphaeropsis malorum*, the conidial state of *Physalospora obtusa*). None of these diseases is of major economic importance in France.

Observations made in a plantation in the Baïse valley (Lot-et-Garonne) from 1942 to 1946 revealed that numerous leaf spots of *M. sentina* were usually present at the end of May and they increased in number until September, when heavy defoliation set in. The most susceptible varieties were Beurré Hardy and Passe-Crassane followed by Pierre Corneille, Beurré Giffard, Jeanne d'Arc, and Souvenir de Jules Guindon, while Soldat Laboureur was not attacked. It is probable that the dry springs of 1942 and 1943 favoured the spread of the disease in that plantation situated on a slope, while a similar plantation down in the valley and near the river was unaffected. Copper sprays considerably reduced infection on all varieties.

Attacks of *P. leucotricha* are usually confined to the tips of young shoots and branches of cordons and espaliers, no secondary infection being produced. Studies made for two years on unprotected trees showed that the most susceptible apple varieties were Cox's Orange Pippin, Lane's Prince Albert, and Gravenstein, and the most susceptible pears Reine d'Anjou and Louise Bonne. In a large apple orchard in Lot-et-Garonne in 1946, severe infection and defoliation occurred on Jonathan, Winesap, and Wagener apples.

P. obtusa appears most frequently as frog-eye leaf spot in France; it was very widespread in this form in Gironde and Lot-et-Garonne during 1945. Branch canker caused by *Nectria galligena* [ibid., xxiii, p. 80] causes severe damage to apple and pear nursery cordons as well as unprotected trees throughout Europe [ibid., xxv, p. 456].

Boyd (O. C.). **Early development of Apple scab.**—*Plant Dis. Reptr*, xxxii, 5, p. 190, 1948. [Mimeographed.]

A few overwintered leaves in Massachusetts orchards showed an abnormally early apple scab (*Venturia inaequalis*) [*R.A.M.*, xxvii, p. 137 and next abstract] ascospore development. At the end of March (10 to 12 days after the snow had melted) wet leaf samples from several orchards gave a light ascospore discharge

in the laboratory. The data indicate that in many orchards perithecia reached nearly full maturity with a small number of ripe ascospores before the onset of winter; most of the early spores were dead when examined in March, but the immature asci survived and the warmer weather favoured their rapid development.

It is concluded that early autumn dropping of scabbed leaves and low, damp orchard sites are the main factors responsible for early perithecial development.

Knoppien (P.) & Vlasveld (W. P. N.). **Vier jaren voortgezet onderzoek over de schurft van Appel en Peer, Venturia inaequalis (Cke) Wint. en Venturia pirina Ad.** [Four years' continued research on Apple and Pear scab, *Venturia inaequalis* (Cke) Wint. and *Venturia pirina* Aderh.]—*Tijdschr. PlZiekt.*, liii, 6, pp. 145–180, 2 graphs, 1947. [English summary.]

Further investigations in 1942, 1943, 1944, and 1946 on the most appropriate times for the application of treatments against apple and pear scab (*Venturia inaequalis* and *V. pirina*) in Holland [*R.A.M.*, xxvi, p. 63 and preceding abstract] are fully described. It was found impracticable to apply Holz's methods of temperature aggregates [ibid., xviii, p. 531] to the prediction of the maturity dates of the first ascospores, as the ripening of the perithecia preceding the discharge of the spores was experimentally proved to be influenced also by humidity. The daily inspection of a number of artificially moistened leaves likewise failed to provide a reliable basis for the establishment of a spray calendar, though it could be used in conjunction with precipitation data, to forecast the daily progress of ascospore maturation after the initial liberation.

During the period under review the course of ascospore discharge varied greatly with the prevailing meteorological conditions both as regards the number of main 'flights' and their correlation with bud development. From 1938 to 1940, inclusive, there was only one main 'flight'; in the following years two or more. The conclusion from the first series of observations as to the adequacy of one pre-blossom spray proved untenable, therefore, in the subsequent seasons. The difficulty in the prediction of ascospore liberation periods lies in the absence of reliable long-term weather forecasts, notably in respect of rainfall.

Experiments by Keitt and Jones [ibid., vi, p. 299], Wilson [ibid., vii, p. 644], Wiesmann [ibid., xii, p. 178], and the authors have shown that the time of leaf fall in the autumn influences the moment of the main ascospore 'flight' in the following spring [cf. ibid., xxvii, p. 137]. Generally speaking, a delay in the former process will entail a corresponding retardation in the latter. Late defoliation, therefore, is a favourable sign, portending the postponement of ascospore discharge until a period in the spring when conditions are relatively adverse for the pathogen. In this connexion the mean temperature during the first fortnight after leaf fall plays an important part. Wilson's observation that 13° C. is ideal for the inception and early development of the perithecia was corroborated by the 1943 results in the present study.

Leaf fall, however, is not the sole factor concerned in the spring extrusion of ascospores, as was shown by the variations in this process among different leaves from a given tree shed at approximately the same time. Among other agencies (some unknown) that may be implicated are the overwintering conditions (local differences in temperature and humidity) and variations in pathogenicity of the several physiologic races of the fungi. Not all the perithecia from a single leaf discharge their ascospores at the same time. The duration of the liberation period is influenced by temperature, as shown by a test in 1944 in which one lot of ten fragments of a Beauty of Boskoop apple leaf, each bearing a perithecium, was laid on moistened filter paper in an open Petri dish at 5°, while another set was held under comparable conditions at 18° to 20°. The maximum discharge period in the former batch was 10 days as against 15 in the latter, while all ten perithecia

had completely discharged their ascospores in 18 days at the higher temperature compared with 61 at the lower.

The maximum incidence of ascospore infection is determined not only by their discharge period but also, and more particularly, by their aerial dispersion (the so-called 'ascospore flight'), and further depends on the stage of bud development and the weather conditions, especially in respect of precipitation, atmospheric humidity, and temperature, operating at the critical juncture. The amount of conidial infection is regulated by the intensity of the 'conidial showers' and rainfall. Conidial germination tests should preferably be made in rain water at 21°, the germination percentage in this series after 126 hours being 92 compared with 18 and 50 in tap and distilled water, respectively, and 36 and 50 in rain water at 5° and 10°, respectively. There was no material difference between the results obtained with old and fresh rain water.

Marked differences in reaction to scab have been observed between individual trees of the same variety. At the centre for manurial experiments at Wageningen, for instance, one Bonne Louise d'Avranches pear tree was much more severely attacked than another only 2 m. distant. A knowledge of the causes of such variations might have an important bearing on control.

To sum up, pre-blossom treatments based on bud development are not invariably effective [ibid., xxv, p. 399]. In theory the ascospore liberation method of prediction, founded on the anticipated development of the pathogens, should give accurate results, but its practical application is complicated by the absence of long-term precipitation forecasts. The results of Dutch experiments in the 'perithecial stage' control practised in the United States, by treatment of the fallen leaves with dinitro-ortho-cresol eradicants such as elgetol [ibid., xxi, p. 494 *et passim*], indicated the necessity for the general adoption of the method to achieve success along these lines. The cost of the preparations, moreover, is very high.

MULDER (D.). **Gebreksziekten van vruchtbomen. I Kaligebrek. II. Magnesiumgebrek.** [Deficiency diseases of fruit trees. I. Potash deficiency. II. Magnesium deficiency.]—*Tuinbouw*, ii, 3, pp. 65–66; 11, pp. 268–270, 6 figs., 1947.

Potassium deficiency threatens to become widespread in Dutch soils owing to the scarcity of potassium compounds during the war, and is likely to be intensified by unbalanced applications of nitrogen. Its symptoms on different fruits are briefly described, and attention is drawn to the possibility of confusion with damage from wind or sprays and magnesium deficiency [cf. *R.A.M.*, xxiv, p. 323]. Where potassium deficiency occurs, the normal soil amendment of 200 kg. should be increased to 300 or 350 kg. per ha., or more in cases of fixation. The nitrogen–potassium ratio should be 150:150 to prevent depletion of the latter element.

Magnesium deficiency symptoms in fruit trees have only recently been recognized in Holland, where they were formerly attributed to spray injury or drought. Shortage of magnesium does, in fact, predispose the trees to spray injury, but in the former case the necrotic pattern is symmetrical on both halves of the leaf, whereas in the latter it is unevenly distributed, following the course of the spray fluid. The relationship between nitrogen and magnesium is exceptional, an excess of the former increasing the uptake of the latter. The symptoms of magnesium deficiency are briefly described on apples of the Cox (group), Jonathan, Glorie van Holland, Zigeunerin, Transparente de Croncels, Zuccamaglio, Yellow Transparent, and Golden Delicious varieties and portrayed as they appear on White Winter Calville, Laxton Superb, and Signe Tillisch. On Manx Codlin they are virtually indistinguishable from those of potassium deficiency. Pears are less susceptible than apples to magnesium deficiency: when affected they develop symptoms resembling those observed on the three first-named apple varieties, i.e., necrosis of the leaf tissue between the veins on either side of the middle vein.

Where the immediate amelioration of magnesium deficiency is indicated, the trees may be given four applications of 2 per cent. magnesium sulphate mixed with lime-sulphur. Used as a fertilizer magnesium sulphate does not take effect for two or three years.

Maag (R.). **Le développement de la lutte antiparasitaire dans l'arboriculture suisse.** [The development of anti-parasitic control in Swiss arboriculture.]—*C. R. Ier Congr. int. Phytopharm., 1946*, pp. 283–288. [? 1948.]

In 1926 the author published his first spray schedule for fruit trees in Switzerland [cf. *R.A.M.*, viii, p. 318], consisting of one winter application of soluble carbolineum, two pre-floral and two post-floral treatments with lime-sulphur and lead arsenate, and a late application with lime-sulphur to the fruits when in mid-development. The programme remains substantially the same to-day.

In some parts of Switzerland subject to scab [*Venturia inaequalis*: ibid., xxvii, p. 273: and *V. pirina*] it may be necessary to apply up to six treatments, while the same number may be necessary elsewhere in wet seasons. Colloidal iron sulphide has proved an excellent adhesive and when added to copper carbonate the mixture arrests developing scab infection. Cupric treatments, however, may cause leaf scorch and fruit russeting. At present, 1·5 per cent. lime-sulphur is used for pre-floral treatments, 1 per cent. for the post-floral, and 1 per cent. lime-sulphur (or 0·15 per cent. copper carbonate, 45 per cent. metallic copper) for late treatments. Winter treatment is repeated every year, and the pre- and post-floral treatments are applied with as short an interval as possible. Cherries, plums, and peaches are also sprayed with lime-sulphur. On cherries, one cupric treatment two to four weeks after flowering is effected when the fruits are attacked by gloeosporiosis [*Glomerella cingulata*: ibid., xxii, p. 400] and the combined winter treatment with 5 per cent. soluble carbolineum plus 2 per cent. copper oxychloride makes it possible to dispense with two or three summer applications of lime-sulphur against shot hole (*Clasterosporium carpophilum*: ibid., xxiii, p. 349]. On stone fruits the combined winter treatment eliminates the necessity for the pre-floral and first post-floral treatments.

Andrén (F.). **Besprutnings försök mot Äppelskorv.** [Spraying experiments against Apple scab.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1947*, 5, pp. 69–73, 1947.

Bordeaux mixture, applied at concentrations of 0·5 to 4 per cent., gave the best results in apple scab [*Venturia inaequalis*] control experiments on the Signe Tillisch variety in Sweden in 1943, 1945, and 1947 [*R.A.M.*, xxv, p. 563]. Cosan was effective in the dry summer of 1943 but failed in the wet one of 1945. Pomarsol and nosprasit were highly efficacious in 1943, but after the war they disappeared from the market. The lime-sulphur wash, antivermin, also proved satisfactory, especially in the dry seasons of 1943 and 1947. Of two sulphur sprays tested in 1947, ciba [ibid., xxvi, p. 169] (1 per cent. plus adhesive) was more effective than spersul (0·2 per cent.) [ibid., xxvi, pp. 175, 326]. The maximum number of sound fruits (97·1 per cent. as against 34·9 untreated) was obtained in 1947 with Bordeaux mixture. In 1943 the same treatment resulted in 95·8 and nosprasit, pomarsol, and cosan in 96·8, 91·3, and 90·8 per cent. healthy fruits, respectively, compared with 25·1 per cent. untreated.

In tests on the Sävstaholm variety from 1945 to 1947 the average percentages of sound fruits were slightly higher in the blocks sprayed with Bordeaux than in those treated with antivermin. Cupro-maag at 0·1 to 0·3 per cent. was injurious to the trees.

In 1946 and 1947 the sound fruits in the sprayed blocks generally weighed heavier than the scabbed ones. In 1946 the average weights of the healthy and

scabbed Bordeaux-sprayed apples (Oranie variety) were 79 and 54 gm., respectively, and on Sävstaholm 77 and 54, respectively. The corresponding figures for sound and scabbed fruits treated with antivermin were 80 and 61 on the former variety and 68 and 67 on the latter, respectively; with cupro-maag 83 and 68, and 50 and 41; with the same plus 1 per cent. sulfo-maag (lime-sulphur) 89 and 59, and 71 and 46; and with cuzol 103 and 67, and 59 and 40. In 1947 the damage from scab was not excessive.

Anderson (H. W.). **Pear diseases and their control.**—*Trans. Ill. hort. Soc.*, lxxx, (*1946*), pp. 285–291, 1947.

During the past three seasons pear trees in central Illinois have been almost completely defoliated by leaf spot (*Fabraea maculata*) [*R.A.M.*, xviii, p. 38]. Some selections in an experimental planting of oriental pears (*Pyrus ussuriensis*) at Urbana were completely defoliated by midsummer, while others were practically immune. The commercial varieties Kieffer and Garber, although fairly resistant, are still susceptible enough to become defoliated, Seckel is highly susceptible, and Duchess and Lincoln are intermediate. Experiments carried out in the last two years have shown that fermate controls *F. maculata* as effectively as Bordeaux and is less likely to cause russeting of the fruit.

Within the next ten years several pear varieties resistant to fireblight [*Erwinia amylovora*: ibid., xxv, p. 206] should be available to growers; three varieties which seem to be sufficiently resistant to warrant trial are Waite, Richard Peters, and Orient.

Scab [*Venturia pirina*: ibid., xxvi, p. 347] and sooty blotch [*Gloeodes pomigena*: ibid., xxiv, p. 266], which become important only when weather conditions favour their development, can also be controlled by the leaf spot spray. *Septoria* leaf spot [*Mycosphaerella sentina*: ibid., viii, p. 120] may attack nursery stock and cause severe defoliation on young trees in southern Illinois but is not generally considered a serious disease.

Day (L. H.). **The influence of rootstocks on the occurrence and severity of bacterial canker, Pseudomonas cerasi, on stone fruits.**—*Proc. Amer. Soc. hort. Sci.*, l, pp. 100–102, 1947.

After reviewing briefly the records of the incidence of bacterial canker (*Pseudomonas cerasi*) in California [*R.A.M.*, xiii, p. 451; xviii, p. 689], the author states that plum varieties top-worked on Salwey peach 16 years ago are practically free from the disease. In orchards in Placer County similar trees show a much milder form of infection than adjacent ones on myrobalan [*Prunus cerasifera*] roots. Santa Rosa, Duarte, and President plums are very susceptible to bacterial canker, while Kelsey and Beauty are practically resistant, regardless of the rootstocks on which they are growing. Santa Rosa and Duarte plums with strong scion roots growing from above the union with the peach stocks were more seriously affected than those which remained on peach roots. Removal of the scion roots prevented further injury. Santa Rosa trees on their own roots were all killed in three years, while in the same orchard only a small number of those on peach roots showed injury at the end of six.

Gaudineau (Mlle M.). **Les Monilias des arbres fruitiers et les invasions du Monilia cinerea.** [The Monilias of fruit trees and attack by *Monilia cinerea*.]—*C. R. Ier Congr. int. Phytopharm., 1946*, pp. 219–225, 1 fig. [? 1948.]

In this paper, read at Héverlé [Belgium], before the first International Congress of Phytopharmacy, 15th to 19th September, 1946, the author records that in France *Monilia cinerea* [*Sclerotinia laxa*: *R.A.M.*, xxv, p. 304; xxvi, p. 304] causes blossom

blight and branch canker of apricot, particularly in the Rhone valley, and affects plum trees in the south-west, often following insect attack. It occurs in epidemic proportions only in wet springs, as, for example, during 1945, when cherry, apricot, and peach trees were attacked. Losses among peaches in that year amounted to 75 per cent. for the varieties Mayflower and Charles Ingouff and 50 per cent. for Amsden. Another attack observed near Langoiran shortly before maturity caused a loss of 80 per cent. in the Triumph variety. The number of young fruits attacked was markedly reduced by two applications in June of either sulphur bentonite spray at 500 gm. per hl. or a wettable sulphur at 2,500 gm. per hl.

Van Koot (Y.). **Bestrijding van chlorose bij Perziken en Pruimeboomen onder glas door middel van boorgatbehandeling.** [Control of chlorosis in Peach and Plum trees under glass by means of bore-hole treatment.]—*Tuinbouw*, iii, 1, pp. 7–10, 5 figs., 1947.

Exact directions are given for the therapy of chlorosis in glasshouse peach and plum trees by the introduction, through holes bored in the stems, of iron or manganese citrate [cf. *R.A.M.*, xxii, p. 118; xxv, pp. 1, 2, *et passim*]. The salts should be applied at a dosage of 5 to 10 gm. per 10 sq. m. ground surface, according to the density of the leaf canopy, not later than December or January—well before the termination of dormancy. Iron citrate should be used in the form of flakes, not as a powder. Fairly low temperatures should be maintained during the spring if necessary by ventilation, in which case the soil must be watered to ensure high atmospheric humidity. The bore holes should extend about half-way through the stem and measure 1 cm. in diameter (or 0·6 cm. if the diameter of the stem or branch is less than 5 cm.). As a rule two or more holes are required; they should be disposed in spiral form and not at the same level. Immediate sealing is necessary to bar the entrance of wound parasites through the bore holes, and after each operation the implements should be disinfected in 4 per cent. formalin.

Campbell (L.). **Strawberry diseases in Washington.**—*Pop. Bull. Wash. agric. Exp. Sta.* 187, 23 pp., 15 figs. (14 col.), 1948.

In this popular bulletin, written chiefly for growers, are described the symptoms and means of control of the principal diseases of strawberries in Washington and the Pacific Northwest, namely, yellows [strawberry yellow edge virus: *R.A.M.*, xxiv, p. 423; xxv, p. 38] and crinkle [strawberry crinkle virus], leaf spot (*Mycosphaerella fragariae*) [ibid., xxvi, p. 32], scorch (*Diplocarpon earliana*) [ibid., xxvii, pp. 28, 176], blight (*Dendrophoma obscurans*), powdery mildew (*Sphaerotheca humuli*), red stele [red core] (*Phytophthora fragariae*) [ibid., xxvii, p. 122], root rot, caused chiefly by *Rhizoctonia* sp. [ibid., xxvi, p. 400], grey mould (*Botrytis cinerea* [ibid., xxvi, p. 205]), the physiological diseases known as dud and cat-facing, and the genetic weakness termed June yellows [ibid., xxv, p. 385]. The name 'dud' is given to the condition in which strawberries do not completely recover from transplanting because of inadequate root development. There are indications that a minor element deficiency in the soil may be a contributory factor to the condition, which is favoured by delay in planting. Cat-facing is caused for the most part by frost during blossoming resulting in the destruction of the developing seeds and unequal growth of the fruits. A key to the various diseases is provided at the end of the bulletin.

Bliss (D. E.) & Lindgren (D. L.). **The use of thiomate '19' on Dates and its effect on fruit spoilage.**—*Rep. Date Grs' Inst., 1947*, pp. 5–9, [? 1947].

From 1946 to 1947 tests were carried out in California [cf. *R.A.M.*, xxvi, p. 338] to determine the efficiency of thiomate '19' (5 per cent. fermate in sulphur dust)

in preventing fungus spoilage of Deglet Noor, Khadrawy, Saidy, and Medjhool dates caused chiefly by *Aspergillus niger*, *Alternaria citri*, *Pleospora herbarum*, and *Penicillium* sp. The percentage of spoilage was reduced in all the treated test plots, significant differences being obtained on four where fungus spoilage had been most severe. On the Deglet Noor plot at Cathedral City, fungal spoilage was reduced from 79·15 per cent. for the untreated to 50·35 per cent. for the treated fruit, thus saving one-third of the crop. On the Saidy plots at Palm Village, Mecca, and Bard, losses were reduced from 22·74 to 8·65, 9·36 to 3·21, and 45·84 to 18·48 per cent., respectively. In no case did the application of this fungicide impair the quality of the fruit. The use of moist rotating brushes in the packing shed was found to be the best method of removing dust residue, the amount of residue from thiomate 19 being reduced from 5·100 p.p.m. to 1·987 p.p.m. compared with 4·368 p.p.m. when cleaned with dry rotating brushes.

Holmes (F. O.), Hendrix (J. W.), Ikeda (W.), Jensen (D. D.), Lindner (R. C.), & Storey (W. B.). **Ringspot of Papaya (Carica papaya) in the Hawaiian Islands.**—*Phytopathology*, xxxviii, 4, pp. 310–312, 1948.

Papaw ring spot was first observed in the Territory of Hawaii at Kailua, Oahu, in March, 1945. Its occurrence and symptomatology were described by Lindner *et al.* in *Hawaii Farm & Home*, viii, pp. 10, 12, 14, 1945. Later experiments by Jensen [*R.A.M.*, xxvi, pp. 143, 534] established as the agent of the disease a virus transmissible by aphids (*Myzus persicae*). In these tests the symptoms developed in 11 to 21 days after inoculation.

The most distinctive and dependable feature of infection is the formation on the surfaces, still mostly green, of fruits approaching maturity, of yellow rings, $\frac{1}{8}$ to $\frac{3}{4}$ in. in diameter, with green centres. Foliar symptoms include elevation or puckering of the tissue between the veins and veinlets of the youngest leaves and irregular mosaic patterns in expanded ones. The mosaic effects are most conspicuous in field trees during the winter, becoming more or less masked during the summer. 'Papaw mosaic' would be an appropriate name for the new disease, but it has already been applied to another disorder of the same host in Hawaii [ibid., xviii, p. 693], as well as to papaw viruses in China [ibid., xv, p. 385] and Trinidad [ibid., xviii, p. 808].

In the spring of 1945, in co-operation with the Board of Agriculture, a survey of the island of Oahu was made to determine the distribution of the ring spot, which may substantially limit commercial production of the fruits, though the plants are seldom or never killed by the virus. In the Kailua-Maunawili district, near the eastern end, there was a fairly high percentage of infected plants (nearly 100 per cent. on one farm) but within half a mile of this point the incidence of the ring spot fell progressively to a 20 per cent. level.

Infection spread rapidly within the several plantings during the winter and spring but slowly in the summer months, presumably in accordance with the seasonal abundance of the aphid vectors. During the latter part of 1945 the disease made rapid headway in the Kailua-Maunawili district in the direction of the prevailing winds, but little lateral dissemination occurred. By the spring of 1946 the area of virtually complete infection had spread from one farm to a number of others within a half-mile radius, with proportionate increases in the region lying immediately to the south-west. A survey of the islands of Kauai, Maui, Molokai, and Hawaii in June and July, 1946 revealed no trace of the ring spot.

Of the four possible methods for the control of the disease, viz., attack on the insect vectors, substitution of immune or highly tolerant papaw varieties for those now cultivated, interpolation of crop-free periods, and destruction of diseased trees, the last-named would appear to be the most practicable under existing circumstances.

Fabre (R.). **La phytopharmacie et son évolution.** [Plant disease control and its development.]—*C. R. Ier Congr. int. Phytopharm., 1946*, pp. 51–66. [? 1948.]

The author touches on the history of the control of plant parasites and diseases from the earliest times to the present day and discusses the legislation on the subject at present existing in France, particularly that relating to the sale and use of plant protectives.

Degand (P.). **Pour l'extension et l'unification, sur le plan international, de la réglementation, de la fabrication et du débit des substances destinées à combattre les parasites et les maladies végétaux et pour la création d'une phytopharmacopée internationale.** [For the extension and unification on an international level of the regulation, manufacture, and sale of materials for the control of plant parasites and diseases and for the preparation of an international phytopharmacopoeia.]—*C. R. Ier Congr. int. Phytopharm., 1946*, pp. 650–656. [? 1948.]

The author puts forward the view that legislation affecting materials used in plant disease control is desirable on an international level. The same products should bear the same names in all countries and an international phytopharmacopoeia should be available for reference. Further, if the countries that manufacture and use the various products govern their sale and manufacture by similar regulations, the exchange of products will be greatly facilitated, as a material prepared in one country will be suitable, perhaps with slight modification, for use in another. Regulations governing products used in plant disease control should specify how the materials are to be used and be designed to prevent fraud. The author develops these views with reference to existing regulations in Belgium and finally puts forward certain proposals. After a general discussion, the assembly agreed to place before the Permanent International Committee of Plant Protection a proposal that there should be international standardization and definition of the chemical criteria required for materials used in plant disease control, and the standards defined incorporated in an international pharmacopoeia. Further, it is hoped that every country will adapt its own regulations to meet, as far as possible, the proposals put forward by the Congress.

Tilemans (É.). **Modifications à apporter à la réglementation belge sur le commerce des produits antiparasitaires.** [Modifications desirable in the Belgian regulations on the sale of antiparasitic products.]—*C. R. Ier Congr. int. Phytopharm., 1946*, pp. 535–540. [? 1948.]

The author after discussing the Belgian regulations governing the sale of plant protectants containing toxicants [*R.A.M.*, xxv, p. 592] suggested an amendment to provide that manufacturers should add a colorant and an odorant to toxic products to prevent their use in the preparation of foodstuffs. The amount of active materials present in all anti-parasitic substances should also be stated.

Powell (D.). **Problems involved in the naming of fungicides.**—*Agric. Chemicals*, iii, 4, pp. 49, 73, 75, 1948.

The sub-committee set up to study fungicide nomenclature in the United States [*R.A.M.*, xxvi, p. 553] has decided to confine its work to the selection of trivial names for established compounds and for new ones.

Martens (P. H.). **Finesse comparée des oxychlorures et des oyxdules de cuivre.** [Comparison of the fineness of copper oxychlorides and copper oxides.]—*C. R. Ier Congr. int. Phytopharm., 1946*, pp. 519–526, 4 graphs. [? 1948.]

The author, using Robinson's pipette method (*J. agric. Sci.*, xii, p. 306, 1922),

compared the particle sizes of a number of forms of copper oxychloride and copper oxide the results of the work being tabulated and expressed graphically. For good products it is suggested that 90 per cent. should remain in suspension after 5 mins., 80 per cent. after 15 mins., and 50 per cent. after 30 mins.

Wilcoxon (F.) & Morgan (R. L.). **Surface active agents in foliage sprays.**—*Industr. Engng Chem.*, xl, 4, pp. 700–702, 1948.

The following is a summary of the information derived from a study of the extensive literature on foliage spray additional agents. The function of these preparations is to render solids wettable or to promote emulsification. Their presence usually reduces the amount of actual deposit because of increased run-off. Their effect on rain resistance is variable, and there is often an optimum concentration for best results. The efficiency of contact sprays is enhanced by surface-active agents, but that of residual-type sprays may be increased, decreased, or not affected according to the materials and concentrations used. The spreading coefficient is a fairly reliable measure of wetting tendency, whereas the surface tension of the spray is inadequate for this purpose. Actual rain or washing tests should be performed to determine the value of additional agents in the promotion of rain resistance.

Davis (J. F.). **A sprayer attachment for rapidly applying small quantities of spray materials.**— *J. Amer. Soc. Agron.*, xxxix, 9, pp. 835–836, 1 fig., 1947.

An apparatus devised at the Michigan Agricultural Experiment Station for the accurate distribution of spraying materials over small areas, e.g., in greenhouses, consists of a cylinder from a small pressure grease gun sealed at one end after removal of the plunger mechanism. A brass cap, threaded to screw on the cylinder, is fitted with an air intake connexion and an outlet for the spray material. Regular sprayer fittings are fitted and a small petcock may be attached to the outlet if desired. The spray material is placed in the cylinder, the required pressure built up by means of the hand pressure pump, and the hand-operated valve in the sprayer hose released. Spraying is then carried out in the usual way, except that the material is forced from the auxiliary cylinder rather than from the tank itself.

Moons (J.). **Le milieu et le pH en phytopharmacie. Note préliminaire.** [The environment and the pH in plant protection. Preliminary note.]—*C. R. Ier Congr. int. Phytopharm., 1946*, pp. 480–482. [? 1948.]

The author draws attention to the desirability of investigating the optimum pH values for the growth of plant parasites. It may, perhaps, prove possible considerably to simplify present fungicidal treatments by modifying the pH value of the materials used.

Farrar (M. D.). **Development of new insecticides and fungicides. Relation of chemical research laboratories.**—*Industr. Engng Chem.*, xl, 4, pp. 680–681, 1948.

An interesting account is given of the organization and functions of the Crop Protection Institute, which was established in 1921 at Durham, New Hampshire, under the auspices of the National Research Council to serve as a liaison unit between manufacturing companies and the experiment stations. By means of grants to the Institute, manufacturers were able to establish research fellowships at 35 State experiment stations. Since its inception the Institute has expended over $1,000,000 on research, mostly in connexion with insecticides and fungicides, the results of which have been published in 76 technical bulletins.

The inauguration of the Crop Protection Institute coincided with an era of rapid expansion in the field of chemistry, and recent developments in agricultural

chemicals [*R.A.M.*, xxvii, p. 375] are so outstanding that the market for new and better plant protectives appears to be almost unlimited.

Horsfall (J. G.). **Fungicides in food production.**—*Industr. Engng Chem.*, xl, 4, pp. 681–682, 1948.

Specifications for the ideal fungicide, theories of the mechanism of killing fungi, and the performance of new organic fungicides are discussed in the light of recent research [see preceding abstract].

Leukel (R. W.). **Recent developments in seed treatment.**—*Bot. Rev.*, xiv, 5, pp. 235–269, 1948.

This comprehensive account includes the common names, chemical composition, source, rate of application, and principal uses of the available organic and inorganic fungicidal compounds and a more detailed account is given of their uses as seed treatments for cereals [*R.A.M.*, xxvii, p. 136] and other field crops [ibid., xxvi, p. 573]. The practicability of heat treatments [ibid., xxvii, p. 328], and others involving the use of gases [ibid., xix, p. 75; xxvii, p. 305], ultra-violet and infra-red rays [ibid., xvii, p. 393] is discussed and the results obtained by various workers regarding seed treatment with hormones [ibid., xx, pp. 438, 555], the use of fungicides in combination with insecticides, and the effect of storage on the emergence of treated seed are presented. A bibliography of 173 titles is appended.

Abiusso (Noemi C.). **Microensayos de fungicidas en el laboratorio.** [Micro-assays of fungicides in the laboratory.]—*Publ. misc. Minist. Agric., B. Aires*, Ser. A, iv, 39, 35 pp., 5 figs., 2 graphs, 1948. [English summary.]

This study falls into two parts, of which the first is concerned with the biological factors affecting spore germination by the slide-germination (moist chamber) method [*R.A.M.*, xxii, p. 489; xxvi, p. 497], using the fungi *Gloeosporium cyclaminis* from *Cyclamen persicum* [ibid., xxv, p. 578], a strain of *Botrytis cinerea* from the Phytopathological Laboratory of José C. Paz, F.C.P., *Tilletia tritici* [*T. caries*] and *Helminthosporium sativum* from wheat, *Fusarium culmorum* from hemp, and *F. vasinfectum* from cotton. Of these, *G. cyclaminis* and *F. vasinfectum* proved to be the most suitable for the object in view by reason of their copious sporulation and high germination percentages.

The following are among the conditions for spore germination requiring standardization: method of obtaining spores, spore suspension concentration, age, source, and number of transfers, temperature, light, and time needed for germination. All the fungi used in the tests germinated best at 24° C., except *T. caries*, for which 18° was the optimum [see above, p. 416]. A 20- to 24-hour period sufficed for all except *T. caries*, which did not germinate until the sixth day. The spores germinated equally well in light and darkness, excellent results being uniformly obtained in distilled water.

In the second part, laboratory biological tests of the following compounds gave interesting results. Copper sulphanilate inhibited the germination of *G. cyclaminis* at 1 in 20,000 and of *T. caries* at 1 in 50,000, the corresponding figures for copper sulphate being 1 in 50,000 and 1 in 80,000, respectively. The germination of *F. vasinfectum* and *G. cyclaminis* was inhibited by cetyl piridine chloride at 1 in 200,000. Mercury ortho-chlorophenolate suppressed the germination of *G. cyclaminis* and *F. culmorum* at 1 in 10,000,000, *G. cyclaminis* succumbed to mercury alkyloxychloride at 1 in 100,000 (1 in 140,000 in one test), and *F. vasinfectum* at 1 in 200,000. Mercury sulphanilate and mercury phenylacetate both inhibited the germination of *G. cyclaminis* at 1 in 100,000. No germination of *F. vasinfectum* occurred in the presence of hydroxymercurinitrophenol at 1 in 100,000 or 1 in 200,000 in two separate tests, while the same compound inhibited *G. cyclaminis* at 1 in 200,000.

McCallan (S. E. A.). **Bioassay of agricultural fungicides.**—*Prof. Pap. Boyce Thompson Inst.*, ii, 4, pp. 23–39, 1947.

In this paper (presented at the XIth International Congress of Pure and Applied Chemistry, London, 19th July, 1947 and reprinted from *Agric. Chemicals*, ii, 9, pp. 30–34, 67; ii, 10, p. 45, 1947) the author discusses, with a review of the recent relevant research work, some of the factors involved in the bio-assay of agricultural fungicides, such as fungicidal action, general types of methods, test fungi, interpretation of data, accomplishments, and limitation. Most laboratory methods appropriately have attemped to assay protectant value. Interest in standardization is stressing the importance of the slide germination method, and its attendant fund of basic information, while various developments have emphasized the necessity for using precision apparatus for applying the chemicals. Greenhouse methods have allowed more attention to be paid to the fungus-host-chemical relationship. Bio-assay, however, lacks consistency within itself and also with field results. The former drawback is being eliminated; the second is more difficult to cope with, but its reduction is essential. At present, more attention should be paid to the development of suitable methods for assessing the specificity of new compounds. A bibliography of 53 titles is appended.

Mack (G. L.) & Schroeder (W. T.). **A comparison of aircraft dusting and ground spraying for the control of Tomato diseases.**—Abs. in *Phytopathology*, xxxviii, 4, p. 314, 1948.

Six alternate treatments with zerlate and tribasic copper sulphate (54 per cent.) were applied to tomatoes as dusts with a Bell helicopter and with a Stearman fixed wing aircraft, and as sprays with a trailer-drawn brush-boom spray equipment, adjusted to deliver 4 lb. zerlate or 4 lb. metallic copper per acre. Ten-row plots, each about 1·7 acre in extent and separated from one another by treated five-row buffer plots, were randomized in each of three blocks. Data were obtained only from the five centre rows in each plot. After the fourth application, the deposition and distribution of copper on the upper and lower surfaces of 20 leaves, selected at random from each plot at three different positions on the plant, were determined by a print method and analysed statistically. Coefficients of variability denoted a much more uniform distribution of the fungicide with the ground sprayer than with either of the aircraft. Copper deposit ratings were significantly related to total yield and blight [*Phytophthora infestans*] control. On this basis the ground sprayer ranked first, the helicopter second, and the aeroplane third. The ground sprayer also proved significantly more effective against anthracnose [*Colletotrichum phomoides*: *R.A.M.*, xxvii, p. 392] than either of the aircraft.

Rowell (J. B.) & Howard (F. L.). **Air blast application of oil-soluble fungicides to row crops.**—Abs. in *Phytopathology*, xxxviii, 4, p. 315, 1948.

Modern air blast methods of pesticide application require a reduced proportion of carrier. Similarly, fungicides compatible with the new oil-soluble insecticides are needed for simultaneous application. Quantitative data on the specifications necessary to implement this principle of disease control were obtained by means of experiments with a modified Potts-Spencer 'Mist Blower' mounted on a Bolens HiBoy row-crop two-wheel tractor. Particle size and type of oil are of major importance in safety on potato and tomato foliage. A wide distribution of pattern induced by turbulence is essential for uniformity of coverage and avoidance of injury. Oil-soluble fungicides were applied with little or no damage to field plots of potato, tomato, cucumber, and snap bean [*Phaseolus vulgaris*]. Bean anthracnose [*Colletotrichum lindemuthianum*: *R.A.M.*, xxvi, pp. 435, 476] control was demonstrated with mycotox-4 (substituted phenyl ester) and onyx DL-1 (didodecyl

ammonium bromide) carried in 3 gal. Shell horticultural base oil No. 7 per acre. Cucumber downy mildew [*Pseudoperonospora cubensis*] infection was reduced 25 per cent. by fungicide-oil mist treatment.

Berk (S.). **Fungicides for fungus-proofing glue-glycerol-bonded cork gaskets.**—*Industr. Engng Chem.*, xl, 2, pp. 262–267, 4 figs., 1948.

Forty disinfectant treatments applied to protein-bonded cork and incorporating, with appropriate diluents of solvents, 14 fungicides, together with a number of resins and water-repellents are described from the Frankford Arsenal, Philadelphia [cf. *R.A.M.*, xxvii, p. 147]. A ten-minute immersion of the cork gasket in the disinfectant solution is primarily a surface treatment. The results of fungus-resistance tests on the treated gaskets, using four organisms (*Aspergillus niger*, *Chaetomium globosum*, *Penicillium* sp., and *Trichoderma* sp.) and three methods of incubation, two at 29·4±0·6° C. for six or two weeks, and one in a tropical humidity chamber, are tabulated and discussed. Three formulations containing 2 per cent. para-nitrophenol conferred complete protection on protein-bonded cork in all the tests, while almost equally satisfactory results were obtained with 2 per cent. para-nitrophenol plus 5 per cent. paraffin wax or aluminium stearate, 1 per cent. para-nitrophenol plus 2 per cent. salicylanilide, and 1·8 per cent. 3, 5-dinitro-ortho-cresol.

Berk (S.). **Fungus resistance of treated vegetable fiber gaskets.**—*A.S.T.M. Stand.* 150, pp. 46–49, 2 figs., 1948.

The efficiency of six fungicidal treatments against the growth of mould (*Aspergillus niger*, *Chaetomium globosum*, and *Penicillium* sp.) on vegetable fibre gaskets was determined [cf. preceding abstract]. The chemicals were suspended or dissolved in water, ethanol, isopropanol, or Stoddard solvent. Complete protection was conferred on paper and vegetable fibre gaskets by 2 and 4 per cent. copper pentachlorophenate, 3 per cent. salicylanilide plus 10 per cent. paraffin wax, and 0·4 per cent. sodium pentachlorophenate. In the case of the last named, however, the treated material became saturated with moisture when incubated under conditions of high humidity. Zinc dimethyldithiocarbamate at 2, 5, and 10 per cent. gave partial or quasi-complete control of the test organisms. With a vegetable fibre gasket material H, salicylanilide and dihydroxydichlorodiphenyl failed to prevent mildew development. No increased resistance was imparted to the paper gaskets by the incorporation of salicylanilide, dihydroxydichlorodiphenyl methane, or sodium pentachlorophenate in the paper alone, in the impregnant alone, or in both. In a cycled tropical humidity chamber, the gaskets treated with salicylanilide, dihydroxydichlorodiphenyl, and sodium pentachlorophenate were resistant to infection.

Ryberg (O.). **The world needs an international organization for plant protection with a permanent executive committee. An address to the First Congress for Plant Protection.**—*C. R. Ier Congr. int. Phytopharm., 1946*, pp. 644–647. [? 1948.]

The author advocates an international organization for plant protection, with a permanent executive committee and a central bureau to deal with current matters.

Gallay (R.). **État actuel de la lutte antiparasitaire en Suisse.** [The present state of anti-parasitic control in Switzerland.]—*C. R. Ier Congr. int. Phytopharm., 1946*, pp. 601–624, 2 figs., 2 graphs. [? 1948.]

During the past four years widespread use has been made in Switzerland of red copper oxide for the control of vine mildew (*Plasmopara viticola*) [cf. *R.A.M.*, xxvii, p. 272], so far with promising results. The material is easy to prepare and

apply, causes less burning than Bordeaux mixture, and does not leave an unsightly deposit. In many experiments red copper oxide saved the harvest when the untreated vines showed 100 per cent. loss from *P. viticola*. It has not yet, however, been established that the material is in all circumstances as good as Bordeaux mixture. In many experiments the vines treated with red copper oxide showed more infection on the leaves and fruit than those treated with Bordeaux mixture. In the author's opinion, the ability of red copper oxide to control *P. viticola* depends more closely on frequent spraying than is the case with Bordeaux mixture. Also Bordeaux mixture is more resistant to leaching.

Virus diseases of potatoes are a matter of some concern; examination of seed potatoes for commercial use is regularly carried out by research stations, and those parts of Switzerland where potatoes degenerate most rapidly have now been determined. Steps are being taken to grow seed potatoes in certain parts of the Juras and the Alps.

Bibliography of references to the literature on the minor elements and their relation to plant and animal nutrition. Second, Third, Fifth, and Seventh Supplements to the Third Edition.—67 pp., 1941, 78 pp., 1942, 96 pp., 1944, 121 pp., 1947, Chilean Nitrate Educational Bureau, Inc., 120 Broadway, New York.

These publications [cf. *R.A.M.*, xxvi, p. 213] present further abstracts, selected largely from *Chemical Abstracts* and the *Experiment Station Record*, on all aspects of minor element nutrition. The seventh supplement includes four indexes, viz., general, author, botanical, and animal nutrition, the author index presenting the names of all the authors shown in the original abstracts.

Freeman (G. G.) & Morrison (R. I.). **Trichothecin: an antifungal metabolic product of Trichothecium roseum Link.**—*Nature, Lond.*, clxii, 4105, p. 30, 1948.

The authors describe the properties of the antifungal substance produced by *Trichothecium roseum* [*R.A.M.*, xxvii, p. 83] which they have isolated in crystalline form, and propose the name 'trichothecin'.

The antifungal activity was tested by means of a spore-germination assay using *Penicillium digitatum*. The conidia were completely inhibited by 1·25 mgm. per l. of trichothecin and those of *Botrytis allii* by 6·25 mgm. The growth of the following fungi on beer wort agar was completely checked by the concentrations given (mgm. per l.): *P. digitatum* (0·64), *Fusarium graminearum* (16), *Paecilomyces varioti* (80), *Saccharomyces carlsbergensis* (16), and *Mucor erectus* (80). Aqueous solutions of trichothecin were stable at pH 1 to 10 for at least 48 hours at 20°.

Miller (P. R.). **The Research and Marketing Act crop plant disease forecasting project.**—*Plant Dis. Reptr*, xxxii, 5, pp. 160–166, 1 diag., 1948. [Mimeographed.]

The devastating epidemic of tomato late blight (*Phytophthora infestans*) in 1946 led to a demand for an effective forecasting service, which was established in 1947 covering 32 eastern States of the United States [*R.A.M.*, xxvi, p. 427; xxvii, p. 341]. The successful operation of this service has resulted in the authorization of the Research and Marketing forecasting project which is now functioning as a warning service for late blight of potatoes as well as tomatoes and downy mildew of cucurbits (*Pseudoperonospora cubensis* [ibid., xxvii, p. 346] and downy mildew (blue mould) of tobacco (*Peronospora tabacina*) [ibid., xxvi, p. 347]. All these diseases are widespread in the eastern part of the United States in which the project is at present operating as in 1947 and this whole region has been divided into three, namely, the North-eastern, South-eastern, and North-central, with a State Experiment Station in each region serving as headquarters. The service operates through

key pathologists designated to work with it in each State and in each co-operating province of Canada. The key men send reports on dates and places of first appearance, weather of the past week, spread of disease to new areas, and losses incurred. The reports are assembled by the Plant Disease Survey into a warning letter and transmitted to the State key reporters and also to the Agricultural and Insecticide and Fungicide Association. The key pathologists are solely responsible for making this information available and issuing control recommendations.

Ainsworth (G. C.). **The rules of nomenclature for micro-organisms.**—*J. gen. Microbiol.*, ii, 1, pp. 97–102, 1948.

In this paper, the purpose of which is to advocate care in the use of names for micro-organisms and to draw the attention of those who desire to propose new taxonomic groupings or to change old names to certain requirements of the International Rules of Nomenclature, the author refers to the tentative Code approved by the Fourth International Microbiological Congress in 1947. This Code, which emphasizes the interdependence of bacterial and botanical nomenclature, is essentially an abbreviation and rearrangement of the Botanical Rules for bacteriologists. The similarities and differences between the International Rules of Botanical and Zoological Nomenclature are noted, and brief directions are given for dealing with new species, name changes, and synonyms. A final section is devoted to the literature of the subject.

Mainland (D.). **Statistical methods in medical research. I. Qualitative statistics (enumeration data).**—*Canad. J. Res.*, Sect. E. xxvi, i, pp. 1–166, 11 graphs, 1948.

The aim of this study is to help investigators to apply the appropriate statistical methods to qualitatively classified clinical and laboratory data. Section A includes definitions and principles, section B 40 examples for comparative purposes, and Section C a discussion on problems that arise in the examples. Tables which can be used in non-medical investigation are presented.

Wilkins (W. H.). **Investigation into the production of antibacterial substances by fungi. Preliminary examination of the eighth 100 species, all Basidiomycetes.**—*Brit. J. exp. Path.*, xxviii, 6, pp. 416–417, 1948.

The following fungi showed 'strongly positive' anti-bacterial properties to *Bacterium coli* and *Staphylococcus aureus* [cf. *R.A.M.*, xxvi, p. 504; xxvii, p. 252]: *Amanita vittadinii*, *Clitocybe aurantiaca*, *C. flaccida*, *C. fragrans*, *C. hirneola*, *Coniophora bourdotti*, *Coprinus erathrismus*, *C. friesii*, *C. miser*, *C. picaceus*, *C. plicatilis*, *C. quadrifidus*, *C. sphaerophorus*, *Corticium centrifugum*, *C. effuscatum*, *Naucoria semi-orbicularis*, *Pholiota erebia*, and *Tricholoma panaeolum*. A further 20 species were characterized as 'weakly positive'.

Wade (G. C.). **Laboratory methods for testing the resistance of textiles to attack by fungi.**—*J. Coun. sci. industr. Res. Aust.*, xx, 4, pp. 445–458, 3 figs., 2 graphs, 1947.

In pure culture tests of the resistance of treated textiles to fungal attack carried out in the Victoria Department of Agriculture and Munitions Supply Laboratories, the method of Thom *et al.* (*Amer. Dyest. Reptr*, xxiii, pp. 581–586, 1934) was at first used, with *Stachybotrys atra* [*R.A.M.*, xxvii, p. 116] as the test organism, the inoculations being made with an atomizer. In later tests, *Memnoniella echinata* [ibid., xxvii, p. 84] replaced *S. atra*, and *Aspergillus niger* was used for testing waterproofing losses [ibid., xxvi, p. 252]. Inoculation with mixed fungi was not

adopted, as many were mutually antagonistic. When untreated cotton duck was inoculated with *M. echinata*, *S. atra*, *Chaetomium* sp., and combinations of these, *M. echinata* became dominant and other fungi were excluded. *Chaetomium* and *Stachybotrys*, when used together, grew each in a well-defined area and did not invade parts already affected by the other. The tensile strength of duck inoculated with a mixture of *M. echinata* and *Chaetomium*, or of these with *S. atra*, was significantly greater after incubation than that of duck inoculated with *M. echinata* alone. *S. atra* was found to produce a toxic principle inhibiting the growth of *A. niger* and *M. echinata*, and *Penicillium luteum* one inhibiting *A. niger*.

For the tests an agarized mineral salts medium was poured into glass boxes to a depth of $\frac{1}{4}$ in. The test strip ($11 \times 2\frac{1}{8}$ in.) was supported above the medium on two glass rods wedged in the dish. After autoclaving the strip was pressed down on the agar. There was no significant difference between Thom's medium (sodium nitrate 3 gm., dipotassium hydrogen phosphate 1 gm., potassium chloride 0·25 gm., magnesium sulphate 0·25 gm., agar 10 gm., and water 1,000 ml.) and Greathouse's [ibid., xxii, and p. 73], using *S. atra*, and the former only was used in subsequent tests. Inoculation with a pipette and an atomizer showed no significant difference in efficiency. When mercerized cotton strips were inoculated with suspensions containing 670,000, 380,000, and 120,000 spores of *S. atra* per c.c., it was found that, within these limits, differences in concentration had no effect on the results. The loss in tensile strength of cotton duck inoculated with *M. echinata* or *S. atra* reached a maximum in 14 days.

Squares of 18-oz. cotton duck inoculated with a spore suspension of *S. atra* were completely sterilized by exposure to methyl alcohol vapour or to chloroform vapour for three hours at room temperature. Strips of untreated duck retained enough methyl alcohol after exposure to inhibit growth of *S. atra*. It was found that the methyl alcohol could be completely removed from fabrics by transferring either to a sterile desiccator kept at 40° and evacuated for one hour, or to a special oven which could be used for both sterilizing and evacuating.

The results of experiments to determine the optimum moisture content for soil burial tests indicated that when the moisture content was 50 to 70 per cent. of the water-holding capacity there was small variation in loss of tensile strength of cotton duck strips, but at 80 per cent. deterioration was greater. The rate of loss of tensile strength at 90 per cent. water-holding capacity was high during the first seven days, but then declined rapidly.

For routine tests, a soil having a roughly determined moisture content of 65 to 70 per cent. was used. A compacted layer 1 in. deep was placed in the bottom of glass boxes and the unsterilized fabric buried under another $\frac{1}{2}$ in. The boxes were incubated at 30° for 14 days, water being added by spraying to replace loss by evaporation.

It appears from the results that most materials which withstand soil burial would also withstand pure culture tests. However, soil burial might eliminate treatments which would give good results on materials not normally coming into contact with the soil. An objection to pure culture tests is that fungi more tolerant of fungicides than the test organisms may be encountered in the field. Workers should, therefore, not confine their attention to one or two fungi. Whatever type of test is used, some physical determination, such as loss of tensile strength or waterproofing, should be used as the criterion. The amount of visible growth may be entirely misleading, vigorous fungi may not cause deterioration of waterproofing, and absence of visible growth is no indication that it has not occurred. Failure to obtain complete correlation between laboratory tests and field performance is probably due largely to inadequate laboratory conditioning treatments. In testing new materials it is desirable to expose treated pieces to natural weathering, preferably under tropical conditions, before submitting them to laboratory tests.

Roschman (C.) & Thews (E. R.). **Observations on the growth of fungi on paint films.**—*Paint Varn. Prod. Mgr*, xxviii, 1, pp. 3–6, 8, 24, 1948.

This is a useful discussion of the available information on the conditions promoting fungal growth on paint films, the types of films liable to the defect, colour indications of the various groups of fungi involved, and methods of restoration of infected areas.

McGowan (J. C.), Brian (P. W.), & Hemming (H. G.). **The fungistatic activity of ethylenic and acetylenic compounds. I. The effect of the affinity of the substituents for electrons upon the biological activity of ethylenic compounds.**—*Ann. appl. Biol.*, xxxv, 1, pp. 25–36, 1948.

Results of preliminary experiments in which a number of compounds containing an ethylenic double bond have been assayed for fungistatic activity with *Fusarium graminearum* [*Gibberella zeae*], *Penicillium digitatum*, and *Botrytis allii* as test organisms indicated that fungistatic activity is associated with the tendency of the substituents to withdraw electrons from the double bond. Nitro-ethylenes and fumarates for example are fungistatic. Tetra-iodoethylene was highly fungistatic, but this is hardly attributable solely to the withdrawal of electrons from the double bond by the iodine atoms.

Grove (J. F.). **The fungistatic activity of ethylenic and acetylenic compounds. II. Esters of halogenofumaric acids and acetylene dicarboxylic acid.**—*Ann. appl. Biol.*, xxxv, 1, pp. 37–44, 1948.

In assessing the fungistatic activity of a number of prepared derivatives of acetylene dicarboxylic, halogenofumaric, and related acids and using the same test organisms [see preceeding abstract] the author found that the lower halogeno- and thiocyanofumarates and acetylene dicarboxylates were highly fungistatic. It is suggested that the fungistatic action of the two series of compounds discussed may arise from interference with enzyme systems.

Barnett (H. L.) & Lilly (V. G.). **The interrelated effects of vitamins, temperature, and pH upon vegetative growth of Sclerotinia camelliae.**—*Amer. J. Bot.*, xxxv, 5, pp. 297–302, 1 graph, 1948.

In experiments carried out at the West Virginia University, *Sclerotinia camelliae* [*R.A.M.*, xix, p. 350] was found to have a total deficiency of biotin and a high deficiency of thiamin, which were not altered by environmental changes. A partial deficiency for inositol increased at 22°, 25°, and 26° C., and was slightly modified by the pH of the medium. With added inositol the optimum temperature for vegetative growth was 22° to 25° [cf. loc. cit.], but the same concentrations inhibited growth at 27°, the degree of inhibition increasing with the rising concentration of inositol.

Rangel (J. F.). **As bases biológicas da certificação de Batata para plantio.** [The biological bases of seed Potato certification.]—*Bol. fitossan. Minist. Agric., Rio de J.*, ii, 3–4, pp. 157–182, 6 figs., 3 diags., 1945; iii, 1 pp. 35–46, 1946. [Received May, 1948.]

This is a full account of the methods of seed potato certification used in the United States. It comprises, *inter alia*, observations on the history and economic aspects of the practice, its application to several virus diseases, and the organization of work on the seed plot, including the choice of suitable sites, roguing, systems of indexing, and planting and harvesting dates. A bibliography of 55 titles is appended.

Roland (G.). **Valeur de la technique de la bouture d'œil pour l'étude de l'état sanitaire des plantes de Pommes de terre.** [The value of the tuber index method in the study of the health of Potato plants.]—*Parasitica*, iii. 1, pp. 44–49, 1947. [Flemish summary.]

The results are given of tests carried out in Belgium in which the tuber-index method [cf. *R.A.M.*, xxvi, p. 559] was applied to (*a*) six varieties of potato mainly affected with streak [potato virus Y], and (*b*) 11 varieties affected with both mosaic and leaf roll. In the former experiment (1944) the temperatures in the greenhouse ranged from 10° to 27° C. in March and from 4° to 29° in April, while in the latter (1946) the corresponding figures were 11° to 29° and 1° to 34°.

The data obtained showed that under the experimental conditions the method gave a fairly reliable indication of the presence of leaf roll, but only irregularly revealed the presence of streak and mosaic.

Lihnell (D.). **Virussmittan vid klyvning av Sättpotatis.** [Virus infection through cutting of seed Potatoes.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1947*, 2, pp. 17–21, 1947.

An experiment was performed to determine whether potato virus X could be transmitted by means of cut tubers, using the Early Puritan variety as the source of infection. The same knife was used throughout the test, Early Puritan tubers being cut alternately with those of (*a*) Karna, and (*b*) Bintje. The results afforded no evidence of transmission in this way, the percentages of infection being almost identical in the progeny of the cut tubers and in those of the whole ones serving as controls.

Ossiannilsson (F.). **Overföringsförsök med Potatisens Y-virus genom bladlöss.** [Transmission experiments with Potato virus Y by means of aphids.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1947*, 5, pp. 68–69, 1947.

In the summer of 1947 aphids of the species *Myzus persicae*, *Doralis* [*Aphis*] *rhamni*, and *Macrosiphum euphorbiae* were collected from virus-free potato or other plants, starved for 4 to 18 hours, then allowed to feed for 1½ to 2 minutes on a virus Y-infected potato leaf, and finally transferred to healthy tobacco plants (one aphid per plant). Next morning the aphids were removed and the plants taken to a greenhouse where serological tests were applied under Dr. Lihnell's supervision to ascertain the results. These were as follows: *Myzus persicae* transmitted the virus to 6 out of 22 plants, *A. rhamni* to 8 out of 40, and *Macrosiphum euphorbiae* to 3 out of 38 [cf. *R.A.M.*, xxi, p. 302].

A. rhamni and *M. euphorbiae* are widely distributed in different parts of Sweden. Unlike *Myzus persicae*, both are 'wild' species independent of human activities. Further investigations are required to determine their practical importance as vectors of potato virus Y.

Dickinson (S.) & Keay (Margaret A.). **Growth of Phytophthora infestans (Mont.) de Bary on artificial media.**—*Nature, Lond.*, clxii, 4105, p. 32, 1948.

Among various media tested for culturing *Phytophthora infestans* the most reliable was one made from 2·5 per cent. dried ground-up leaves and stems of young garden pea plants, 2·5 per cent. sucrose, 1 per cent. agar, and distilled water. The sucrose, agar, and half the water are sterilized at 15 lb. pressure for 15 minutes, the rest of the water with the dried pea-plant powder heated to 40° C. is added, mixed thoroughly, and the medium tubed. The tubes are left at laboratory temperature for 18 to 24 hours, sterilized at 10 lb. pressure for 6 minutes, and sloped. In test-tubes at 18° the fungus usually covers the agar in a week and sporulates in two to three weeks. At this temperature cultures require subculturing every

four to five weeks, at 10° every ten to twelve. Greater sporulation occurred when the tubes were kept in closed jars. Mould contamination can be avoided by exposing the cultures once weekly to room humidity for a few hours and replacing them in clean dry jars. Boiling-tube cultures, which provide good sporulation even when not enclosed, may keep alive as long as 17 weeks, but the fungus should be well established first in jars. Sporulation was exceedingly abundant at times on a dried potato leaf medium, but was often unreliable.

Andrén (F.). **Lagringsförsök med Potatis från besprutode odlingor.** [Storage experiment with Potatoes from sprayed stands.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh.*, *1947*, 2, pp. 21–24, 1947.

In the middle of February, 1947, 50-kg. samples of potato tubers from the plots sprayed with various fungicides against late blight [*Phytophthora infestans*] in 1946 [*R.A.M.*, xxvi, p. 351] were examined to determine the extent of decay. In the series in which all the preparations were applied at varying copper concentrations 2 per cent. Bordeaux mixture gave the best results, being rated at 0·2 in a 10-graded infection scale compared with 9·5 for the untreated, but several commercial plant-protectives were almost equally satisfactory, e.g., 0·5 per cent. copper oxide maag (0·4) and 0·5 per cent. soltosan (0·5). Where all the chemicals contained equal amounts of copper there was little difference in their relative efficiency, none of the ratings in the above-mentioned scale exceeding 0·6.

Hänni (H.). **Le tubercule de Pomme de terre atteint de Phytophthora infestans joue-t-il un grand rôle pour l'hivernage du champignon et, si oui, quelles mesures faut-il prendre pour éliminer ces 'foyers'?** [Does the Potato tuber infested by *Phytophthora infestans* play a great part in the overwintering of the fungus, and if so, what steps should be taken to eliminate these 'foci'?]—*C. R. I^er Congr. int. Phytopharm.*, *1946*, pp. 271–281, 4 figs. [? 1948.]

In April 1942, potato tubers affected by *Phytophthora infestans* [*R.A.M.*, xxvii, p. 220] were planted 6 to 8 cm. deep, but the few sickly shoots arising from these showed no sign of the fungus [cf. ibid., xxvii, p. 36].

In a second experiment with 250 healthy Bintje tubers inoculated with *P. infestans* the eyes of the tubers were destroyed but new shoots grew from secondary eyes. Not the slightest symptom of infection developed on such shoots and this result was confirmed in 1945 and 1946.

Thirty days after planting a naturally infected tuber in leaf mould in a glass-house, abundant sporangial formation was observed on two weakly shoots which had hardly been able to penetrate a layer 3 cm. deep; in the parallel test in the open, tubers planted at a depth of 6 to 8 cm. in semi-heavy soil developed no infection, though the meteorological conditions were optimum for the fungus.

The evidence, therefore, shows that a diseased tuber does not constitute a dangerous focus of infection at the beginning of the growing season, unless the conditions are highly favourable. Some of these conditions were realized in Switzerland in the spring of 1946. On 14th June an extensive outbreak was found in Thurgovie, in a field of the Erdgold variety, and the primary focus of infection was found to be 1·5 km. away where a cartload of infected tubers had been thrown. On 18th June another primary focus of infection was found in a wheat field containing volunteer potato plants from a previous infected crop.

It is concluded that diseased tubers are the most important source of a new epidemic of *P. infestans* and should be promptly destroyed, together with all volunteer potato plants, while susceptible varieties should be treated with a copper fungicide at an early date or as advised by a specialist. Cereal fields previously planted with potatoes should be treated once with dinitrocresol to destroy foci of infection and weeds.

Johansen (Gudrun). **Kartoffel-bladpletsyge (Alternaria solani).** [Potato leaf spot disease (*Alternaria solani*).]—*Maansdl. Overs. Sygd. Kulturpl.* 295, pp. 9–13, 4 figs., 1948. [English summary.]

Four methods of inoculation with *Alternaria solani*, which produces hard, dry, lesions on potato tubers in Denmark [*R.A.M.*, xxiv, p. 469] were tested, of which the insertion in the tubers of bits of agar cultures proved to be the most effective, though uninjured tubers were also infected by wrapping them in diseased leaves or placing them on agar cultures of the fungus. Typical spots developed in 11 days, and on transference to agar, fragments of the diseased tissue yielded a fungus, which induced characteristic lesions on inoculation into stems and leaves. The tuber rot due to *A. solani* must not be confused with pit rot, in which small, dark, hard, usually circular spots appear on the surface of the tuber, presumably from the toxic emanations of ammonia from decaying matter in the pits.

In experiments during the winter of 1942–3 on the influence of temperature on the development of *A. solani*, 6 per cent. diseased tubers were found among the lots stored at 1·5° to 5° C. for the entire period and 14 per cent. in those transferred on 22nd February from that temperature to 14°.

Săvulescu (Alice) & Hulea (Ana). **Un aspect différent de l'attaque produite par Actinomyces scabies (Thaxt.) Güssow, agent pathogène de la gale ordinaire de la Pomme de terre.** [A different aspect of the attack produced by *Actinomyces scabies* (Thaxt.) Güssow, pathogenic agent of common Potato scab.]—*Bull. Sect. sci. Acad. roum.*, xxix, 9, pp. 607–611, 6 figs., 1947.

Potato scab (*Actinomyces scabies*) is very widespread in Rumania, where the symptoms are generally of the usual kind. In 1945, different symptoms appeared on purple-skinned Blaue Riesen tubers in a field in the commune of Cheia (Department of Prahova). These showed conspicuously raised, confluent, cracked lesions, with corky walls. The affected portions of the tubers presented a markedly blistered appearance, the symptoms thus resembling those due to *A. aerugineus* [*R.A.M.*, i, p. 183]. The white-skinned Parnassia variety, which was growing in the same field, showed the flat lesions of ordinary scab. In culture on glycerinated Czapek medium the organisms isolated from each kind of lesion gave rise, after 20 days, to the same greyish-white aerial mycelium. Both, in the presence of tyrosine, produced a brown pigment, and both liquefied gelatine. The microscopic characters of both were also identical with those of *A. scabies*. Inoculations by planting tubers in infected soil, in artificially inoculated soil, or through wounds resulted in the development of lesions on two varieties only (not including Blaue Riesen, which was unobtainable) and these were characteristic of ordinary scab, while the lesions themselves contained the mycelium of *A. scabies*.

It is concluded that the two forms of the disease observed on Blaue Riesen and Parnassia, respectively, were both due to *A. scabies*. The blistered appearance of the Blaue Riesen tubers appears to be a symptom of *A. scabies* not hitherto reported. Further work is in progress.

Hashioka (Y.). **Studies on the Rice blast disease in the tropics. I. Comparison of the anatomical characters of the leaf epidermal layers of the Japanese and Formosan Rice plants from the phytopathological point of view.**—*Agric. & Hort.* (*Tokyo*), xvii, pp. 848–852, 4 figs., 1942. [Japanese, with English summary. Received June, 1948.]

Rice varieties in Formosa may be divided into two groups according to their resistance to blast (*Piricularia oryzae*) [*R.A.M.*, xxvii, p. 255]: one is the susceptible Japanese group (the so-called 'Horai-to') belonging to *Oryza sativa* subsp. *japonica*, and the other the more resistant Formosan ('Taiwan-to'), comprised in *O. sativa* subsp. *indica*.

The thickness of the outer walls of the motor cells, the long cells, and the accessory cells is greater in the Formosan than in the Japanese varieties. The length as well as the width of the silicated papillae formed on these cells also showed the same tendency. Cellulose and pectin are conspicuously present in the outer walls of the motor cells, less so in the accessory cells, and little or no reaction was observed in those of the other cell groups. These facts appear to bear a close relationship to the findings of some investigators that infection occurs mostly at the motor cells, less frequently at the accessory, and rarely at the long cells and others. On the other hand, the relations between the microchemical differences of the cell membrane and the degree of resistance in the groups are not clear-cut, although the cellulose reaction of the outer walls of the motor cells is somewhat more marked in susceptible than in resistant varieties. The number of the silicated cells showed no apparent correlation, although it appears that they may be more numerous in the Formosan group than in the Japanese. It is concluded that anatomical characters as well as the microchemical nature of the epidermal layer of the leaves may play a part in the resistance-susceptibility relation between the Japanese and Formosan groups of rice plants. Physiological and protoplasmic characters should also be taken into consideration.

HASHIOKA (Y.). **Studies on the Rice blast disease in the tropics. II. Influence of sunlight upon the resistance of the leaves of Rice plants to the blast disease.**—*J. Soc. trop. Agric.*, xv, pp. 33–44, 1 fig., 1943. [Japanese, with English summary. Received June, 1948.]

The influence of sunlight upon the resistance of the leaves of rice plants (up to the early stage of tillering) to blast (*Piricularia oryzae*) [see preceding abstract] was tested by inoculating seedlings grown under various conditions of sunlight. The results of the experiment showed that the length of day and period of sunlight exposure, as well as the intensity of sunlight, vary inversely with the resistance. The number of the silicated cells of the leaf epidermis also bears the same relation to susceptibility. The intensity of sunlight and period of sunshine during growth up to the tillering stage differ considerably between the first and second crops in Formosa, although the length of day during these periods remains almost the same. From the results of the present experiments it is inferred that these differences may not be so important as to determine altogether the resistance of the rice plants. The same applies to the resistance of rice plants both in tropical and more temperate zones, so far as the above-mentioned factors are concerned.

HASHIOKA (Y.). **Studies on the Rice blast disease in the Tropics. III. The mode of prevalence of the Rice blast disease in the island of Hainan.**—*Agric. & Hort.* (*Tokyo*), xviii, pp. 1043–1048, 1149–1152, 1239–1242, 11 figs., 1943. [Japanese. Received June, 1948.]

The prevalence of the rice blast (*Piricularia oryzae*) in the Island of Hainan, southern China, is becoming serious due to the introduction of the 'Horai' varieties, which are generally susceptible to the disease [see preceding abstracts]. Although the temperature is favourable to the fungus almost throughout the year, the disease is especially prevalent in spring, when the first rice crop has reached the tillering stage. The diminution in prevalence at other seasons is due to the increase of host resistance with age, the high temperature prevailing during the second crop season, and other factors. The relation of meteorological conditions and cultural factors to the occurrence of the disease is also discussed, with the conclusion that the prevalence of rice blast in the subtemperate monsoon region, including Formosa, South China (Kwangtong, Kwangsi, etc.), and Hainan, can be attributed to factors distinct from those determining its incidence in the temperate zone.

HASHIOKA (Y.). **Studies on the Rice blast disease in the tropics. IV. Influence of temperature of air and soil upon the resistance of the Rice plants to the blast disease. V. Relation of temperature and humidity to the prevalence of the disease. VI. Relation of age of Rice plants to blast resistance and its significance as a controlling factor for the prevalence of the disease. VII. Influence of temperature on the blast resistance of the Rice plants grown under different nutritional conditions. VIII. Relation of temperature to leaf blast resistance of the different varieties of Rice plants collected from the districts in various latitudes.**—*J. Soc. trop. Agric.*, xv, pp. 53–65, 1 fig.; pp. 99–111, 4 figs.; pp. 161–177, 1 pl., 2 figs., 1943; xvi, pp. 163–176, 1 pl.; pp. 196–204, 1944. [Japanese, with English summaries. Received June, 1948.]

In part IV of these studies the influence of air and soil temperature upon the resistance of the rice plants to blast (*Piricularia oryzae*) [see preceding abstracts] was confirmed by means of inoculation experiments with seedlings and heading plants grown under various conditions.

Resistance increases with the rise of both air and soil temperature under which the plants are grown, although this correlation became less distinct at temperatures above the optimum for plant growth (about 28° C.). The carbon-nitrogen ratio of the leaves increases in proportion to the rise of temperature and consequently to resistance, though this is not so marked at the higher temperatures. The fact that the rice plants become susceptible at the lower temperatures seems to be due to excessive accumulation of nitrogen in the host and to delay in the silicification of the epidermal cells. The severity of blast in the cool first crop season in the tropical and subtropical regions and the comparative freedom from the disease of the second crop is very probably due partly to the influence of the air and soil temperature upon the resistance of the host plants and partly to the effect of environmental factors upon the parasite. The epidemics in the temperate zones may also be due to the temperatures prevailing during the growing or heading of the rice plants.

In part V the author gives the results of experiments concerning the influence of temperatures and humidity upon the invasion of the rice plant by *P. oryzae* and upon the formation and discharge of the conidia. Invasion and disease development take place most easily at 26° to 28° C. and fairly readily at 19° or 32·5°. Moisture above 90 per cent. relative humidity is favourable for disease development and especially so for the formation and discharge of the conidia. Nevertheless, temperature plays a more important part than humidity in disease development both under experimental and natural conditions.

In part VI inoculation experiments with rice plants at different stages of growth are described. The results showed the leaves to be susceptible to *P. oryzae* during the seedling and tillering stages, except the earliest seedling phase, at which the leaves are free from the disease, then become resistant at the last stage of tillering, and maintain higher resistance from heading to maturity. The nodes of the rachides also acquire more resistance in proportion to the days after heading. The period of susceptibility varies considerably according to the environmental conditions, mainly temperature. Increase of blast resistance with age seems to be correlated with the morphological change of the walls of the epidermal cells (thickness and degree of lignification and silicification), and of the sclerenchyma above, below, and around the vascular bundles, the size and number of the thickness of the cell walls, and extent of lignification, and also with changes in the chemical composition of the leaf tissues, particularly the carbon-nitrogen ratio.

From the results of the present work, as well as those of the foregoing, the restriction of the prevalence of rice blast in subtropical regions to the period of tillering of the first crop may be attributed to the combination of host susceptibility with the favourable temperature factor for the parasite. Thus, the change of resistance at different ages of the host may be a factor controlling prevalence in

nature. In tropical regions, where the temperature is almost uniform throughout the year, the prevalence of the disease is controlled merely by the above-named resistance-susceptibility relation of the host, but in the subtropical or temperate zones where the temperature conditions vary at different seasons, this is determined by a temperature factor in combination with the host-susceptibility relation.

In part VII the author describes his studies on the resistance to *P. oryzae* of the leaves of rice plants grown under different nutritional conditions at three degrees of air temperature, i.e., low (15° to 25° C.), optimum (26° to 28°), and high (29° to 32°), the plants being inoculated with the conidia of the fungus. The influence of fertilizers on resistance is stronger at the lower temperatures, at which the plants are generally susceptible, becoming less noticeable with rising temperatures since plants grown under such conditions are normally resistant. Generally speaking, the resistance-susceptibility relation of the leaves is more strongly influenced by temperature than by manuring. The total nitrogen content of the leaves is larger at the lower temperatures than at the higher, but the content of silica is in inverse relation to the former. The content of potassium, which is considered to form one of the elements of resistance, is generally higher at the optimum than at the lower or higher temperatures. Hence it is concluded that the greater susceptibility of plants grown at the lower temperatures is due to the accumulation of nitrogenous compounds in the plant. In subtropical regions the prevalence of rice blast in the first crop and its unimportance in the second are mostly due to the more marked effects of the nitrogenous fertilizers on the susceptibility of plants in the first than in the second crop.

In the concluding study varieties of rice plants collected from districts in several latitudes were grown up to the early stage of tillering at different atmospheric temperatures, and resistance to leaf blast was tested by means of inoculation with conidia of *P. oryzae* to determine the relation between the prevalence of the disease and temperature conditions in both the temperate and the tropical zones.

As already mentioned in part III in most of the varieties tested resistance is enhanced in proportion to the rise in temperature at which the plants are grown, but the change of resistance at various temperatures is more distinct in the Japanese varieties native to the temperate zone than in the Indian ones endemic to the tropical region. The total nitrogen content of the leaves is higher in the Japanese varieties than in the Indian, the latter being more resistant than the former, and the rate of decrease of nitrogen at higher temperatures is more distinct in the former than in the latter. At the minimum temperature (below 10° C.) the seedlings tend to become yellowish and resistant on account of lower concentration of nitrogen, but these phenomena are noticed more distinctly in the Indian varieties than in the Japanese. The above-mentioned relations between varietal resistance and the temperatures at which the plants are grown are considered to be mainly due to the nitrogen metabolism expressed by the change in leaf colour.

HASHIOKA (Y.). **On the rot-disease (the so-called cold-injury) of Rice seed in Formosa.**—*Formosan agric. Rev.*, xxvii, pp. 329–345, 1 fig., 1941. [Japanese, with English summary. Received June, 1948.]

The rot-disease (generally known as cold injury) of rice seeds and seedlings occurs almost every year in Formosa, attacking the nursery beds of the first crop, especially in the northern part of the island, and often inflicts heavy damage on the crop.

The author isolated various species of *Achlya*, *Pythium*, *Brachysporium*, *Fusarium*, *Penicillium*, etc., from the affected seedlings as well as from the infected soil, and proved that one of the first-named genus is pathogenic to those growing on agar media or sterilized soil. Young seedlings grown under glass showed hardly any sign of injury

even when the cultures of *Achlya* sp. were added to the soil, but if they were kept in the refrigerator (the soil temperature of the cooled pots was 0° to 1° C.) for 10 hours, they became severely affected, while uninoculated ones similarly treated were only slightly injured. From these experiments it is concluded that the so-called cold injury of rice seedlings results from the attack of the fungus when the normal growth of the seedlings is checked by low temperatures.

The varieties indigenous to Formosa (Zairai-shu) are more susceptible than those introduced from Japan (Horai-shu). The injury may be controlled as follows: (1) dissolving copper sulphate in irrigation water to obtain a concentration of 0·0025 per cent., about 75 g. copper sulphate being used per are [100 sq. m.]; (2) pouring 2 per cent. copper sulphate solution or 16–16[–100] Bordeaux mixture into the soil before sowing at the rate of 10 l. per are ; (3) coating the seeds before sowing with a precipitation membrane prepared with 2 per cent. solution of copper sulphate and potassium ferrocyanide.

HASHIOKA (Y.). **Relation of temperature to resistance of the several plants to Hypochnus sasakii Shirai (a preliminary report).**—*J. Soc. trop. Agric.*, xvi, pp. 111–113, 1944. [Japanese. Received June, 1948.]

Various plants differing in their optimum temperature for development were grown at three different temperatures, i.e., low (15° to 23° C.), moderate (23° to 28°), and high (28° to 34°) for a certain number of days and all inoculated with the same strain of the rice stem rot fungus, *Corticium sasakii* [*R.A.M.*, xxvi, p. 415]. The growth of the plants used, different varieties of rice, wheat, maize, broad bean, bean [*Phaseolus vulgaris*], and flax, was best at the moderate temperature, fair at the high (except broad bean and flax), and poor at the low, while the degree of infection varied with the plant species. The severity of infection differed even within the high-temperature group, i.e., rice, maize, and bean, and within the low-temperature group, i.e., wheat, broad bean, and flax.

GANGULY (D.). **Studies on the stackburn disease of Rice and identity of the causal organism.**—*J. Indian bot. Soc.*, xxvi, 4, pp. 233–239, 4 figs., 1 pl., 1947.

The stackburn disease of rice [*R.A.M.*, xxv, p. 182] was observed [? in 1945] on deep- and medium-water Amon rice at the Dacca Farm, Bengal, and in neighbouring low-lying districts. The leaves showed large, round to oval spots measuring 3 to 9 mm. in diameter, with grey centres and dark brown margins and sometimes coalescing to form irregular, elongated patches. Generally only a few grains in a head became infected, showing a purplish-brown discoloration with a conspicuous white area at the centre or at one side. Sclerotia occurred usually on the outer surface and sometimes also in the endosperm. In extreme cases the ear-heads bore empty grains. Death of the seedlings owing to the disease was not observed in the field, but under laboratory conditions seedlings emerging from infected seed became rapidly infected; the coleoptile, the first leaf, and the roots were discoloured and bore minute, black sclerotia within the tissue. Complete decay, though not uncommon, was often delayed.

Isolations from leaf spots and diseased seed grew readily on potato dextrose agar and showed no morphological differences.

Inoculation experiments were carried out on 180 plants each of seven rice varieties of three different ages, by spraying with the spore suspension and by placing mycelia on unwounded leaves and leaves wounded by pricking. The inoculated plants were covered and kept moist for about 48 hours, then allowed to grow normally. The results showed low infection rates throughout, Dharial at 6·7 per cent. being the lowest, Nizersail at 33·9 the highest. There was no evident correlation between the age of the seedlings and their susceptibility to the pathogen, though the percentage of infection was slightly higher in the six-week-old seedlings.

Inoculation by wounding was most successful, leaf spots confined to a small area appearing within three to five days, by the other methods after 9 to 12. These data indicate that the fungus is a weak pathogen.

The young hyphae are hyaline, slender, and profusely branched, the branches arising at right angles to the main axis; mature hyphae are creamy-yellow, 3·4 to 5·7 μ in diameter, and septate at regular intervals of 20 to 25 μ. The black, almost spherical sclerotia are more or less embedded within the host tissue, have reticulated walls, are connected by fibrils, and measure 52 to 195 (average 124) μ. The conidiophores, 100 to 175 by 3·4 to 5·7 μ, are not distinctly distinguishable from the mature hyphae. The elongate to fusoid, non-deciduous, 3- to 5-septate, creamy-yellow, thick-walled, straight, terminal conidia are constricted at the septa, measuring 103·2 to 172·7 (including the appendage) by 8·5 to 19·2 μ. The rigid, septate, straight or slightly curved appendage at the tip of the conidium is almost as long as the conidium proper and 2 to 5 μ thick.

The fungus differs from *Trichoconis caudata* [ibid., xxvi, p. 167] in its longer and broader spores, the longer spore body of 4 to 6 cells, the constrictions at the septa, the thicker, longer, and more rigid conidial appendage, and in the different host range. The author regards it as a new distinct species of the hitherto monotypic genus *Trichoconis* and names it *T. padwickii*.

SĂVULESCU (T.). **Contribution à la connaissance des Ustilaginales et Urédinales de Roumanie.** [A contribution to the knowledge of the Ustilaginales and Uredinales of Rumania.]—*Bull Sect. sci. Acad. roum.*, xxix, 7, pp. 471–476, 1 pl., 1 fig., 1947.

This further contribution [*R.A.M.*, xxvi, p. 470] brings the number of Ustilaginales known in Rumania to 87 on 96 plant hosts and the number of Uredinales to 369, on 703 plant hosts. Mention may be made of *Ustilago violacea* [*R.A.M.*, xviii, p. 232; xxv, p. 141; xxvii, p. 23] found in the anthers of *Saponaria officinalis* in 1944, and *Tilletia panicii* [ibid., xxvii, p. 11] found on *Hordeum tetrastichum* in 1946.

RYBERG (O.). **The official export certificates of health for plants are absolutely unreliable. A crisis of confidence in international plant trade.**—*C. R. Ier Congr. int. Phytopharm., 1946*, pp. 634–643. [? 1948.]

The author stresses the importance of preventing the further spread of plant diseases, especially through international plant trade. After reviewing the import regulations in Sweden he adduces reasons in support of the view that the official certificates of plant health sent out from some of the chief plant exporting countries are no guarantee whatsoever that they are free from disease. Many examples were given where these regulations had been deliberately contravened. Until the time comes when importing nations obtain a real guarantee that export control is genuinely adequate, import control should be strengthened and extended. In conclusion he suggests *inter alia* that the different countries should declare an export prohibition for plant products without official certificates, that the certifying authorities make themselves acquainted with the legislation, that firms with bad records be debarred from exporting, and that the Latin and varietal names and the locality of cultivation be specified on the certificates.

Statutory rules and orders, 1947, No. 671. Destructive Insect and Pest Acts, England. The Importation of Plants Order of 1947. Dated April 15, 1947.—7 pp., 1947.

One of the provisions of this Order, which came into force on 1st May, 1947, prohibits the landing in England or Wales of any plant of sugar beet or mangold (except the seed) to prevent the introduction of virus diseases.